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NORTON SOUND - PORT CLARENCE - KOTZEBUE

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SECTION 1 - SALMON

INTRODUCTION

Boundaries

The Norton Sound-Port Clarence-Kotzebue management districts include all waters from Canal Point Light in southern Norton Sound to Point Hope and includes St. Lawrence Island. These management districts comprise over 65,000 square miles, with a coastline exceeding that of California, Oregon, and Washington combined.

Salmon Resources

Five species of Pacific salmon are indigenous to the area with chum (Oncorhynchus keta) and pink salmon (O. gorbuscha) historically being the most abundant. Chum, pink, and chinook (king) salmon (O. tschawytscha) have been found as far north as Barrow; however, these species are uncommon north of the Kotzebue Sound drainages. The northernmost large concentrations of chum salmon are found within the Kotzebue Sound drainages, while large numbers of pink, chinook and coho (O. kisutch) salmon are not found north of Norton Sound. Very small sockeye (red) salmon (O. nerka) populations exist within a few Seward Peninsula drainages and in Kelly Lake on the Noatak River near Kotzebue.

Commercial Fishery

In 1959 and 1960, Department biologists conducted resource inventories which indicated harvestable surpluses of salmon available in several areas. The Department liberalized various regulations and encouraged processors to explore and develop new fishing grounds. As a result, commercial salmon fishing activity has grown significantly since statehood, enabling many local residents to obtain a cash income.

The majority of commercial fishermen and many processing plant workers are resident Eskimos. Commercial fishermen operate set gill nets from outboard powered skiffs to capture salmon. All commercial salmon fishing is done in coastal marine waters.

Salmon effort and catch per unit effort data (CPUE) presented throughout this section have been derived as follows. Boat (or fisherman) hours have been computed after assuming that if a fishing boat delivers during a fishing period, it fished the entire period. The total number of individual boats delivering in any period is multiplied by the number of hours open to commercial fishing. Catch per fisherman (or boat) hour is obtained by dividing the total fishermen hours into the catch for the corresponding period of time. Total fishermen (or boats) is the total number of fishermen making deliveries, regardless of how many deliveries were made or days fished during a particular period or season. There are a number of fishermen who deliver only once or twice during the entire

season. Total days fished is the total number of hours open to commercial fishing during the season divided by 24 hours.

Subsistence Fishery

There are approximately 16,000 people in the area, the majority of whom are Eskimos, residing in more than 26 small villages scattered along the coast and the major river systems. Nearly all of the local people are dependent to varying degrees on the fish and game resources for their livelihood.

Subsistence fishermen operate gill nets or seines in the main rivers and, to a lesser extent, in the coastal marine waters capturing primarily salmon, whitefish, arctic char and inconnu (sheefish). Beach seines are used near the spawning grounds to catch schooling or spawning salmon and other species of fish. The major portion of fish taken during the summer months is sun dried or smoked for later consumption by villagers or their dogs.

Subsistence catch information has been derived from interviews of fishermen, actual counts of fish, and subsistence catch calendars returned by fishermen. Subsistence salmon catches in the Nome subdistrict (subdistrict 1) have been determined from the return of catch calendars as required under a permit system.

The Department conducted annual surveys of the important subsistence salmon fisheries from the early 1960's until 1982. The majority of salmon taken are pinks and chums. Subsistence harvest information prior to 1960 is incomplete or entirely lacking for many years. Beginning in 1983 budgetary restrictions have made it impossible to conduct systematic surveys in each village as was done from 1964 to 1982. For the last 5 years that complete surveys were conducted for Norton Sound (1978-1982) the average subsistence catch was 73,000 salmon including all species (Appendix Table A8). Subsistence surveys for the Kotzebue area were less complete. Documented surveys from several years for different villages indicate total subsistence salmon harvest for the Kotzebue Sound area to be around 75,000. These reported harvests are primarily based on village household surveys. Since not all fishermen are contacted, these harvests should be considered minimum figures. More recent surveys have been conducted on individual areas and will be noted in the following sections.

Management

The Division of Commercial Fisheries of the Alaska Department of Fish and Game is responsible for the management of commercial and subsistence fisheries in this vast area. The permanent full-time staff assigned to this area during 1991 consisted of an area management biologist stationed in Nome, two assistant area biologists stationed in Nome and Kotzebue, and two half-time Field Office Assistants (FOA's) assigned to the Nome office. In addition, summer seasonal assistance in conducting various management and research activities was provided by eleven seasonal biologists and technicians in Norton Sound and Kotzebue Sound. Additional assistance was provided by biologists from the regional staff.

The main objective of the Department's program is to manage the commercial salmon fisheries on a sustained yield basis. Various field projects are conducted to provide information on salmon abundance, migration and stock composition. Summaries of these projects are presented in Appendix G2.

Management of the salmon fishery is complicated by the difficulty in obtaining valid escapement data in this large area and by insufficient comparative catch and return information. Management problems are compounded by the need to provide not only for adequate escapements, but for the needs of several different user groups. Past Alaska Department of Fish and Game policy has been to provide for subsistence as the primary beneficial use of the fishery resource. This policy is now State law. If the subsistence harvest or demands increase, commercial fishing may be restricted. It should be pointed out that increases in commercial fishing efficiency are expected and may balance any immediate decline in subsistence utilization or increase in run size with the result that present regulations will be maintained or made even more restrictive.

The basic regulation that governs the commercial salmon harvest in all districts is the scheduled weekly fishing period. Commercial fishing regulations provide for a total of two to four days of fishing per week during the open season depending on area and season. The Department attempts to distribute fishing effort throughout the entire return to avoid harvesting only particular segments of the return. Occasionally, fishing time is increased or decreased by emergency order, depending upon fishing conditions and the strength of the returns or spawning escapements, as determined by special studies conducted by the Department. Emergency orders issued during the 1989 thru 1991 seasons are presented in Appendix G3.

Weekly fishery reports, which give information on fishery status and fishing schedules, are broadcast during the fishing season over radio KICY and KNOM in Nome, and KOTZ in Kotzebue. In addition, fishery news articles are published in the Nome Nugget and the Arctic Sounder.

NORTON SOUND DISTRICT

District Boundaries

The Norton Sound District includes all waters from Canal Point Light north to Cape Douglas. This district is subdivided into six subdistricts: Nome (Subdistrict 1), from Penny River to Topkok Head; Golovin Bay (Subdistrict 2), from Rocky Point to Cape Darby; Moses Point (Subdistrict 3), from Elim Point to Kwik River; Norton Bay (Subdistrict 4), from Kuiuktulik River to Island Point; Shaktoolik (Subdistrict 5), from Cape Denbigh to Junction Creek; and Unalakleet (Subdistrict 6), from Junction Creek to Black Point (Figure 1).

Each of these subdistricts contain at least one major salmon spawning stream. All commercial fishing is conducted in marine waters and usually concentrated near stream mouths. Subdistrict boundaries were established around the major salmon producing local streams to minimize interception of stocks bound for other areas.

Commercial Fishery Overview

Commercial salmon fishing in this district first began in the Unalakleet and Shaktoolik Subdistricts in 1961. Most of the early interest involved chinook and coho salmon which were flown in dressed condition to Anchorage for further processing. A single U.S. freezer ship also purchased and processed chum and pink salmon during 1961. In 1962, two floating cannery ships operated in the district and the commercial fishery was extended into the Norton Bay, Moses Point and Golovin Bay Subdistricts. The peak in salmon canning operations occurred during 1963.

Since then, markets have been sporadic and often some subdistricts had been unable to attract buyers for entire seasons. A joint venture between KEG (Koyuk-Elim-Golovin) Fisheries and NPL Alaska, Inc., operated from 1984 until mid-season in 1988. A permit issued by the Governor allowed two Japanese freezer ships to buy directly from domestic fishermen and was limited to salmon caught in the internal waters of Golovin and Norton Bays. Currently, the most consistent markets are at Unalakleet and Shaktoolik where fish are purchased, iced, and flown directly to Anchorage for processing and resale.

The commercial salmon fishing season opens by emergency order between June 8 and July 1, depending run timing within subdistricts. The season closes by regulation on August 31 in Subdistricts 1, 2, and 3, and on September 7 in Subdistricts 4, 5, and 6, but processors often terminate their operations prior to the regulatory closure dates. Two 48 hour fishing periods normally occur each week unless changed by emergency order with the exception of the Nome and Moses Point Subdistricts, where two 24 hour fishing periods are scheduled each week.

Commercial fishing gear is restricted to set gill nets, with a maximum aggregate length of 100 fathoms allowed for each fisherman. There are no mesh size or depth restrictions during the normally scheduled periods. The majority of the gill nets fished are approximately 5 3/4 inch stretched measure. In the Unalakleet and Shaktoolik Subdistricts, 8 1/4 inch stretched mesh gill nets are commonly used during the chinook salmon run in June through early July. During years when large pink salmon runs occur, the Department provides fishing periods when only 4 1/2 inch mesh nets or less may be set or drifted. These special small mesh periods are an attempt to target pink salmon without overharvesting the larger sized salmon species.

Most fishermen do not tend their nets continuously once they are set, leaving them unattended overnight. Fish quality suffers due to the length of time fish may be left in the nets and is especially poor when storms prevent fishermen from checking their gear for extended periods of time.

Commercial Fishery Management

The Norton Sound District is managed on the basis of comparative commercial catch data, escapements and weather conditions. A single factor or combination of factors may result in issuance of emergency orders affecting seasons, fishing periods, allowable mesh size, and areas.

Aerial surveys are used to monitor escapements in the majority of the Norton Sound streams. Weather conditions, time of day, type of aircraft, water conditions, bottom conditions, date of survey, and efficiency of the surveyor and pilot must be taken into account when making inter-annual aerial survey comparisons. A counting tower on the Kwiniuk River has been operated since 1965. A second counting tower was also operated on the North River, a major tributary of the Unalakleet River, from 1972-1974 and 1984-1986.

Commercial fishing starts for king salmon in mid June, emphasis switches to chum around June 25, then gradually shifts to coho during the third week in July. Pink salmon are abundant on even years, but there is often essentially no market. The southern Subdistricts 5 and 6 (Shaktoolik and Unalakleet) are sustained fisheries. They target king, chum, and coho salmon, with king and coho catches remaining fairly stable while chum catches have been declining since the early 1980's. Management has consisted of a series of Emergency Orders that open the season, adjust fishing time, restrict mesh size, and occasionally eliminate a fishing period.

Commercial fisheries in Subdistricts 2 and 3 (Golovin and Moses Point) target chum salmon. The commercial chum harvest has dropped dramatically since the mid 1980's. Poor returns has caused very restrictive management actions recently where the seasons have been closed early by E.O. to allow for escapement and subsistence needs.

There has been little or no commercial salmon harvests in the remaining Subdistricts 1 and 4 (Nome and Koyuk). In the Nome Subdistrict this is due to very depressed stocks which in some years require closure or severe restrictions on the fishery. Conversely, the Koyuk Subdistrict has healthy stocks with no markets willing to set up in such a remote area.

Subsistence Fishery Overview

Household subsistence surveys have not been conducted since 1985 in Norton Sound villages due to budgetary restrictions. Daily surveys of Unalakleet River and ocean subsistence fishermen have been conducted annually since 1985 during the chinook salmon run. Although total harvests by subsistence fishers were not documented, effort and catch information were used to judge timing and magnitude of the chinook salmon return. The commercial fishery is delayed until it becomes apparent subsistence needs are being met and chinook salmon are beginning their upstream migration as indicated by the Department of Fish and Game test net in the lower Unalakleet River. There is a growing trend to move subsistence nets from the river mouth out to the ocean in order to avoid large debris loads from spring runoff. It is presently unclear what changes this fishing technique will have on chinook salmon escapement.

Low salmon stock levels in the Nome Subdistrict combined with a large concentration of users has required issuing subsistence harvest permits for the area since 1974. These are issued by regulation to each household and designated fishing location. Each location may have its own catch limit per permit and the fisherman is allowed to change locations after notifying the local Fish and Game office.

Regulatory Actions in Nome Subdistrict

Although pink salmon are usually the most abundant species of salmon in Subdistrict 1 streams, the commercial fishery has targeted chum salmon. The relatively large chum salmon catches in this subdistrict in conjunction with weak local stock abundance implied that the fishery intercepts non-local stocks. A 1978-79 Norton Sound stock separation study tends to confirm this view. Salmon tagged near Nome were re-captured in fisheries from Golovin (Subdistrict 2) to Kotzebue. In an attempt to provide for spawning requirements in addition to an important subsistence fishery that targets local stocks, a commercial harvest guideline of 5,000-15,000 chum salmon was adopted as a regulation.

Due to poor chum salmon escapement during the 1982 and 1983 seasons, the Board of Fisheries, in response to an advisory committee petition, directed the Department to manage the commercial fishery so that chum salmon escapement could be optimized. During the 1984 fall Board of Fisheries meetings, these directives became regulation. In response to public and advisory board proposals, the following commercial fishery restrictions were adopted as regulations:

1) Salmon may be taken commercially only from July 1 through August 31.

2) Fishing periods were restricted to two 24 hour periods per week.

3) Waters west of Cape Nome were closed to commercial salmon fishing.

The Department was also directed to allow a harvest at the lower end of the guideline harvest range of 5,000 to 15,000 chum salmon, as stipulated in 5AAC 04.360.

In addition to these commercial fishing restrictions, a proposal to restrict the sport fishery in the Nome and Snake Rivers was adopted in 1984:

> With a bag and possession limit of 15 salmon, other than king salmon, only 5 could be chum and coho, in combination.

Subsistence permit limits in the Nome and Snake Rivers were restricted to 20 chum and 20 coho salmon. The remainder of the permit limit could be filled with salmon other than chum or coho.

However, even with these restrictive regulations in place, chum escapement goals were difficult to attain. The 1987 fishing season experienced poor returns of both chum and pink salmon to Nome Subdistrict streams. Numerous management actions were made which curtailed commercial fishing activities, and later, sport, personal use, and subsistence efforts as well. Even with such drastic fishery restrictions, escapement goals for chum salmon were not attained during 1987 in the Nome, Eldorado, Flambeau, Bonanza, Snake, and Solomon Rivers. In response to this continuing trend of decreasing chum and pink salmon returns to the Nome Subdistrict, several new regulations were adopted during the 1987 Alaska Board of Fisheries meetings.

With the commercial fishery all but eliminated in recent years, proposals affecting the sport, personal use, and subsistence fisheries were considered. The following new sport fish regulations were adopted for all Nome area road system streams (Seward Peninsula drainages from Cape Prince of Wales to Cape Darby):

1) For salmon other than chinook, 10 per day, 10 in possession, only 3 which may be chum salmon and coho salmon, in combination.

2) For chinook salmon, 1 per day, 1 in possession.

These new regulations superseded those adopted during 1984. Additional new regulations affecting personal use and subsistence fishermen which were adopted in 1987 were:

1) In the Nome River, no person may operate more than 50 feet of gill net in the aggregate.

2) The Nome River was added to the regulation 5AAC 01.170 (e) which states that small mesh gill nets (less than 4 1/2 inch mesh) and beach seines may not be used in specific Nome Subdistrict streams.

The managers have used their E.O. authority to further restrict subsistence fishing. The 1991 season was the most extreme case where the subsistence fishing season began with a closure that was liberalized as the chum return neared escapement goals for individual streams. Escapement goals were eventually met for most rivers in the area (Table 3C).

1989 Season Summary By Subdistrict

Commercial and Subsistence Fisheries

Nome - Subdistrict 1

The commercial salmon season opened July 3 by emergency order. Two fishermen harvested 2 chinook, 123 pink, and 492 chum salmon for a combined total of 617 fish (Tables 1A and 4). Fishing effort was well below the 1984-1988 average of 9 fishermen. One buyer operated in the Nome Subdistrict for two periods, from July 3-July 7. Inclement weather conditions and the lack of a buyer limited fishing effort during much of the season. Fishermen did not sell any salmon as permitted under catcher-seller regulations. The Nome Subdistrict was closed on August 30.

One hundred twenty-four subsistence permits were issued for the Nome area in 1989 as compared to the recent 5-year average (1984-1988) of 218. The reported harvests from the 121 permits returned were 24 chinook, 127 sockeye, 469 coho, 924 pink, and 3,399 chum salmon for a total of 4,943 fish (Table 2A). The total reported subsistence salmon harvest was 35% of the recent 5-year average of 14,202 (Appendix Table A2). This below average reported subsistence catch was

due to both poor salmon returns, restrictive management actions, and poor weather.

Golovin - Subdistrict 2

No salmon were commercially harvested in the Golovin Subdistrict during the 1989 season due to the lack of a market.

Moses Point - Subdistrict 3

The Moses Point Subdistrict opened by emergency order on June 29 for a 24 hour period (Table 6A). Thirteen fishermen harvested 62 chinook and 1,667 chum salmon during this period. No other commercial deliveries were made during the 1989 season. A domestic buyer was present during one period, and flew all salmon out, iced, in-the-round to Unalakleet for transport to Anchorage for processing. Inclement weather conditions and equipment problems hindered the fly-out operation which had been planned by this company for both Subdistricts 2 and 3. On July 13, this subdistrict was closed to commercial salmon fishing due to a weak chum salmon return as indicated by Department tower counts on the Kwiniuk River. The Moses Point Subdistrict was re-opened by emergency order on July 31 for the coho salmon fishery. The fishery was open for two 48 hours periods per week, however since there was no local buying station, no one fished during the month of August. The season closed on August 30.

Norton Bay - Subdistrict 4

No salmon were commercially harvested in the Norton Bay Subdistrict during the 1989 season due to the lack of a market.

Shaktoolik - Subdistrict 5

The Shaktoolik Subdistrict opened by emergency order on June 15 for a 24 hour period(Table 7A). Initial periods were set at 24 hours in length from June 15-20 (periods 1 and 2). On June 22, fishing time was increased to two 48 hour periods a week. The Shaktoolik Subdistrict fished on the regular schedule of two 48 hour periods a week throughout the remainder of the season. One domestic buyer conducted a fly-out operation. Fish were flown to Unalakleet, iced, in-the-round, for transport to processing facilities and fresh markets in Anchorage. This subdistrict was without a buyer for six periods (period 12 from 7/24-7/26 and periods 20-24, from 8/21-9/06) The Shaktoolik Subdistrict closed to commercial salmon fishing on September 6.

Twenty-six fishermen harvested 1,241 chinook, 43 sockeye, 8,066 coho, and 19,641 chum salmon for a combined total of 28,991 fish (Tables 1A and 7A). The chinook harvest was 43% and 39% below the 1984-1988 and 1979-1988 average catches of 2,177 and 2,025 fish, respectively. The coho salmon harvest was 24% and 1% above 1984-1988 and 1979-1988 average catches of 6,491 and 8,014 fish, respectively. The chum salmon harvest was 1% above and 25% below the 1984-1988 and 1979-1988 average catches of 19,489 and 26,158 fish, respectively (Appendix Table A6).

Unalakleet - Subdistrict 6

The Unalakleet Subdistrict receives the most fishing effort in Norton Sound, and has historically not had problems obtaining buyers for their salmon, with the exception of pink salmon.

The commercial fishing periods, openings, and closures in the Unalakleet Subdistrict were the same as those in the Shaktoolik Subdistrict. Because of their close proximity (shared boundary) and the difficulty in obtaining timely escapement information, the Unalakleet River test net was used frequently as an index of salmon abundance and escapement in Subdistricts 5 and 6. Table 8A summarizes catch and effort data by period for the Unalakleet Subdistrict.

A total of 73 fishermen harvested 4,402 chinook, 222 sockeye, 36,025 coho, and 20,825 chum salmon for a combined total of 61,474 fish (Table 1A). The chinook salmon harvest was 25% and 23% below the 1984-1988 and 1979-1988 average catches of 5,877 and 5,702 fish, respectively. The coho harvest was 46% and 21% above the 1984-1988 and 1979-1988 average catches of 26,647 and 29,573 fish, respectively. The chum salmon harvest was 27% and 52% below the 1984-1988 and 1979-1988 average catches of 28,311 and 42,912 fish, respectively (Appendix Table A7).

One domestic buyer operated throughout the entire season. All salmon were flown out iced, in-the-round, to Anchorage to fresh markets or for further processing. The Norton Sound Fishermen's Co-op plant did not operate, however, this facility was leased to receive and ice the salmon delivered dockside. A second domestic buyer operated in the Unalakleet Subdistrict for one period only, during the June chinook fishery. In addition, a few fishermen sold some of their catch to individuals, local businesses, and to an Emmonak-based buyer, as permitted under the catcher-seller regulations.

Escapement

Table 3A lists aerial survey and tower escapement counts in the major index streams of Norton Sound. In general, weather and survey conditions were very poor during most of the season. River water levels were very high during the spring from melt-off of record snowfall levels, and remained unusually high and turbid during the summer. Predominant weather conditions throughout the summer were low ceilings (clouds and fog) and rain. No peak chum or chinook salmon surveys were attained during the entire season. One chum salmon survey was attained on June 30 on the Kwiniuk River, prior to the run peak. Surveys were flown on select streams in the Nome and Golovin Subdistricts for coho salmon in late August and early September. In general, conditions were rated fair, at best, for these surveys. High water levels appeared to have washed away most salmon carcasses. Tannic colored or turbid water conditions were prevalent in most streams from extended periods of rain and high water levels.

The Nome Subdistrict of Norton Sound received the most intensive survey efforts, with several aerial stream surveys attempted, as well as two boat surveys of the Nome River. Salmon stocks local to the Nome area are limited, easily accessed (extensive road system) and exposed to extensive subsistence and sport fishing

pressure. However, most surveys were inconclusive due to poor survey conditions or non-peak timing of surveys.

Chum salmon escapements in the Nome Subdistrict could not be quantified, but appeared to be below average. In the Nome River, the highest chum count (72) was obtained during a late season (August 17) boat survey for coho salmon. The observer, during an aerial survey flown on the Nome River on August 14 noted "apparently very small escapements of chum and pink salmon. Very few redds observed for these species". Chum salmon escapements appeared below average in the Eldorado, Sinuk, and Solomon Rivers as well (Table 3A); these surveys were flown under fair conditions during the August coho return, well past the peak chum salmon returns.

Chum salmon escapements in three Golovin Subdistrict streams (Fish, Niukluk, Boston) could not be estimated. Weather and stream conditions prevented aerial observation of salmon during July and most of August. The same situation occurred in the Moses Point Subdistrict where no aerial counts were obtained for the Tubutulik River. However, the Department has a counting tower on the Kwiniuk River where counts were recorded. Even with just one 24 hour period fished commercially in this Subdistrict, the average escapement goal of 25,000 chum salmon was not attained on the Kwiniuk River which had an expanded count of 13,689 chum salmon past the tower (Table 3A).

Chum salmon escapement counts in the Norton Bay Subdistrict were not documented. However, since no salmon were commercially harvested in Subdistrict 4 this season, it is likely that at least average escapement occurred. Chum salmon escapements could not be documented in the Shaktoolik and Unalakleet Subdistricts. Comparative commercial catch figures and the Department test net catches in the lower Unalakleet River indicate the return of chum salmon was average to slightly below average to these drainages.

The Unalakleet and Shaktoolik Subdistricts contain the major chinook salmon returns although the Norton Bay, Moses Point and Golovin Subdistricts have produced more chinook in recent years. Chinook escapement surveys were also prevented this season due to inclement weather and poor stream conditions. The only escapement count in Norton Sound for chinook during 1989 was the Kwiniuk River tower count of 232 fish. This may be considered below average when compared to the 1979-1988 average tower count of 356 chinook salmon. The Department test fishery in the Unalakleet River indicated an early chinook return with an average overall escapement when compared to annual catch data. These data will be summarized and presented in separate project reports later this year.

The major coho producing streams in Norton Sound are also in the Shaktoolik and Unalakleet Subdistricts, although coho salmon are found in nearly all of the chum producing streams throughout the district. Because of the inclement weather normally experienced in this area during August and September, escapement data for all subdistricts is limited. This year, coho salmon counts were attempted in select Subdistrict 1 and 2 streams in mid-August and early September. Most counts were obtained under fair viewing conditions, and were flown at or near peak spawning activity.

Overall, coho salmon escapements appeared to be poor in northern Norton Sound. The Nome River aerial survey count of 375, made on September 9, was considered to be below average. The Sinuk River count of 75 coho salmon was very poor, as were the Eldorado and Solomon River counts of 87 and 25 fish, respectively. The Niukluk River system count of 182 coho salmon (includes Ophir Creek) was considered to be very poor. No aerial surveys for coho salmon were flown in Subdistricts 3, 4, 5, and 6.

Pink salmon escapements and return strengths were difficult to judge during the 1989 season since no surveys could be flown in July, and since there was no market for pink salmon in the Shaktoolik and Unalakleet Subdistricts. Some pink salmon were observed during August coho surveys on the Nome, Eldorado, and Sinuk Rivers (Table 3A).

Management Concerns

Once again chum salmon escapements in the streams of the Nome and Moses Point Subdistricts fell short of escapement goals. The lack of chum salmon escapement in the Nome River is particularly disturbing when one considers that the Board of Fisheries approved regulations during the 1987 winter meetings further restricting both subsistence and sport fisheries on the Nome River in addition to restrictions in place since 1984. Surveys could not be conducted during July to estimate chum salmon escapement, however, the August coho salmon surveys documented few chum and pink salmon redds. It was becoming apparent that ocean subsistence fishing may also have to be reduced to bring this salmon stock back to its former size.

In the Moses Point Subdistrict only half the chum salmon escapement goal was reached (Table 3A). This is especially disturbing when considering the fact that just one 24 hour commercial fishing period was actually fished.

1990 Season Summary By Subdistrict

Commercial and Subsistence Fisheries

Nome - Subdistrict 1

The commercial salmon season opened July 1 and closed August 31 by regulation. There were no reported commercial catches in this subdistrict for the 1990 season (Table 1B). This was the first time in twenty years that no catches were landed. The reasons for lack of effort were low prices, low numbers of fish and alternative employment opportunities. No buyer operated in the Nome Subdistrict during the entire season. Fishermen did not sell any salmon as permitted under catcher-seller regulations.

One hundred sixty-nine subsistence permits were issued for the Nome area in 1990 as compared to the recent 5-year average (1985-1989) of 213. The reported harvests from the 141 permits returned was 58 chinook, 325 sockeye, 510 coho, 2233 pink, and 4,246 chum salmon for a total of 7,280 fish (Table 2B). The total

reported subsistence salmon harvest was 70% of the recent 5-year average of 10,375 (Appendix Table A2). This below average reported subsistence catch was due to both poor salmon returns and restrictive management actions.

Golovin - Subdistrict 2

The Golovin Subdistrict was opened by emergency order June 22 with a fishing schedule of 5 days per week (Table 5A). This action was taken to provide fishermen more flexibility to sell their catches as permitted under catcher-seller regulations since no formal buyer was present and conservation concerns were observed. An emergency order effective June 25 reduced the fishing schedule to two 48 hour periods per week due to the arrival of a domestic fish buyer who remained for three periods. Fifteen fishermen sold 52 chinook, 21 sockeye, and 15,993 chum salmon. The season closed by regulation August 31.

Moses Point - Subdistrict 3

The Moses Point Subdistrict opened by emergency order on June 25 with a standard two 24 hour period schedule per week (Table 6B). Twenty-three fishermen harvested 202 chinook, 3,723 chum and 501 pink salmon. A domestic buyer who was present during four periods flew most of the salmon out, iced, in-the-round to Fairbanks for processing. During three of the four periods the buyer was able to fly fish on backhauls and thus reduced the cost of freight. However, during the fourth period, he was unable to make arrangements as before, so he purchased only pink salmon roe which could be flown out by small aircraft. On July 12, this subdistrict was restricted by emergency order to a mesh size no larger than 4 1/2 inches to target pink salmon and protect the poor chum salmon return as indicated by the Department of Fish and Game counting tower on the Kwiniuk River. The Moses Point Subdistrict pink gear mesh restriction was lifted by emergency order on August 2 to allow the harvest of coho salmon. No additional commercial catches were reported and the season closed by regulation on August 31.

Norton Bay - Subdistrict 4

No salmon were commercially harvested in the Norton Bay Subdistrict during the 1990 season due to the lack of a market.

Shaktoolik - Subdistrict 5

The Shaktoolik Subdistrict opened by emergency order on June 14 (Table 7B). Initial periods were set at 24 hours in length from June 14-20 (periods 1 and 2). On June 21, fishing time was increased to the standard two 48 hour periods per week which continued through the remainder of the season. One domestic buyer conducted a fly-out operation. Fish were flown to Unalakleet, iced, in-the-round, for transport to processing facilities and fresh markets in Anchorage. The Shaktoolik Subdistrict season was extended by emergency order to September 8, however fishing effort actually stopped August 22 when fish buying operations ceased.

Twenty-eight fishermen harvested 2,644 chinook, 49 sockeye, 4,695 coho, and 21,748 chum salmon for a combined total of 29,136 fish (Tables 1B and 7B). The chinook harvest was 21% and 38% above the previous 5 and 10 year average catches, respectively. The coho salmon harvest was 21% below the previous 5 year average catch and 45% below the previous 10 year average catch. The chum salmon harvest was 28% above and 16% below the previous 5 and 10 year average catches, respectively (Appendix Table A6).

Unalakleet - Subdistrict 6

The Unalakleet Subdistrict receives the most fishing effort in Norton Sound, and has historically not had problems obtaining buyers for their salmon, with the exception of pink salmon.

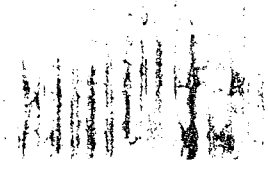
The commercial fishing periods, openings, and closures in the Unalakleet Subdistrict were the same as those in the Shaktoolik Subdistrict. Because of their close proximity (shared boundary) and the difficulty in obtaining timely escapement information, the Fish and Game test net in the Unalakleet River was used frequently as an index of salmon abundance and escapement in both Subdistricts 5 and 6. Table 8B summarizes catch and effort data by period for the Unalakleet Subdistrict.

A total of 73 fishermen harvested 5,997 chinook, 364 sockeye, 52,017 coho, and 23,659 chum salmon for a combined total of 82,037 fish (Tables 1B and 8B). The chinook salmon harvest was 10% and 8% above the previous 5 and 10 year average catches, respectively. The coho harvest was 134% above the previous 5 year average catch and 69% above the previous 10 year average catch. The chum salmon harvest was 1% and 44% below the previous 5 and 10 year average catches, respectively.

One primary domestic buyer operated throughout the entire season. All salmon were flown out iced, in-the-round, to Anchorage bound for fresh markets or for further processing. The Norton Sound Fishermen's Co-op plant did not operate, however, this facility was leased to receive and ice the salmon delivered dockside. A second domestic buyer operated in the Unalakleet Subdistrict during peak periods for chinook and coho salmon. In addition, a few fishermen sold some of their catch to individuals and local businesses as permitted under the catcher-seller regulations.

Escapement

Table 3B lists aerial survey and tower escapement counts in the major index streams of Norton Sound. In general, weather and survey conditions were good during most of the season. River water levels were moderate following the spring break up and continued to drop through much of the chum salmon run. However, heavy rains occurred just prior to the peak chum and coho surveys. In the case of chum, many carcasses and redds were washed away before being counted, while high water allowed coho to spread out and reach areas that could not be counted easily. One other factor affecting surveys this season was a strong pink salmon return that made species discrimination difficult at times.



The Nome Subdistrict of Norton Sound received the most intensive survey efforts because salmon stocks local to the Nome area are limited, easily accessed by road system, and exposed to extensive subsistence and sport fishing pressure. Several aerial and boat surveys were conducted on the Nome River.

Chum salmon escapements in the Nome Subdistrict were again well below average. The peak count of the Nome River was 541 chum while its escapement goal is set at 2,000. Similar low chum counts were obtained from the Sinuk and Eldorado Rivers.

Chum salmon escapements in the Golovin Subdistrict streams (Niukluk and Boston) were below their escapement goals, but near their escapement averages. Chum salmon escapements in the Moses Point Subdistrict rivers (Kwiniuk and Tubutulik) were again well below average. The Kwiniuk River had a preliminary expanded tower count of 13,735 chum salmon with an escapement goal of 25,000. The Tubutulik River had an aerial survey count of 4,350 with an escapement goal of 12,000 chum salmon. It is important to remember that the commercial harvest was also very low in the Moses Point Subdistrict.

An aerial survey of the Ungalik River in the Norton Bay Subdistrict counted a slightly below average number of chum salmon and no salmon were commercially harvested in Subdistrict 4 this season. In the Shaktoolik Subdistrict, the chum salmon escapement survey count on the Shaktoolik River was well below the escapement goal. The aerial survey was flown under poor conditions and high numbers of pink salmon may have confused species discrimination. Comparative commercial catch data indicate an above average return of chum salmon to the Shaktoolik Subdistrict, therefore the assumption was made that an adequate escapement was reached.

Chum salmon escapement to the Unalakleet River system was near the aerial survey average but well below the escapement goal for the North River, a major tributary to the Unalakleet River. Comparative commercial catch figures and the Department test net catches in the lower Unalakleet River indicate the return of chum salmon was below average, but the low level of fishing effort may have allowed for near or slightly below average escapement.

Chinook escapement surveys observed below average numbers in most streams except the Kwiniuk River which obtained an above average number past the counting tower. The Department test fishery in the Unalakleet River indicated a chinook return which was just average overall when compared to previous test net and commercial catch data.

Because of the inclement weather normally experienced in this area during August and September, coho salmon escapement data for all subdistricts is incomplete. This year, coho salmon counts were attempted in select Subdistrict 1 and 2 streams in mid-August and early September. Most counts were obtained under fair viewing conditions and were flown at or near peak spawning activity, however, heavy rainfall preceded the surveys and allowed coho salmon to run farther upstream than normal.

Overall, coho salmon escapements appeared to be poor in northern Norton Sound. The Nome River aerial survey count of 377, made on September 12, was considered

to be below average, as were the Niukluk River and Ophir Creek counts. The Sinuk River count of 95 coho and the Eldorado River count of 44 coho was very poor. An aerial survey of the Kwiniuk River observed slightly above average numbers of coho. No escapement surveys for coho salmon were conducted in Subdistricts 4, 5, and 6. Commercial and test fish catches indicate there was an above average coho return to the Unalakleet Subdistrict.

Pink salmon escapements and returns were very strong throughout Norton Sound. Aerial surveys found pinks at the upper reaches of most streams. Even year pink returns continue to be very good (Table 3B).

Management Concerns

Once again chum salmon escapements in the Nome and Moses Point Subdistricts were of concern, or fell short of escapement goals. The lack of chum salmon escapement in the Nome River is particularly disturbing since commercial fishing effort has almost completely dropped off and regulations continue to become more restrictive each year for sport and subsistence fishermen.

During the 1990 season the chum salmon return began very slowly in the Nome River. Emergency orders were issued to stop both all subsistence salmon fishing and sportfishing for chum salmon in the entire Nome River. Subsistence salmon fishing was later reopened after the chum salmon had passed through the legal fishing zone, but sportfishing for chum remained closed for the season.
The chum salmon return to the Kwiniuk River in the Moses Point Subdistrict was very poor, even though only three commercial chum openings occurred. The spring 1990 Board of Fish imposed a reduced fishing schedule for the subdistrict. In the past, reduced commercial fishing had worked to rebuild the stock from a similar low level.

1991 Season Summary by Subdistrict

Commercial and Subsistence Fisheries

Nome - Subdistrict 1

The commercial salmon season was closed by E.O. on July 1, the day that it normally opens by regulation, and remained closed until August 1. This management action was taken in order to protect the expected low return of chum and pink salmon to the subdistrict. Similar action was taken to close subsistence and sport fishing in the area to improve chum and pink salmon escapement. The managers closed subsistence salmon fishing from June 16 until July 24 in about half the subdistrict and until July 31 in areas of poor escapement. Fishing closures near the community of Nome have caused fishing effort to redistribute to marine waters and to outlying streams. Given the catch rates reported on the permits returned at this time, pink and chum salmon harvests seem to be less than half of that reported in recent years. As a result, escapement goals as a whole in the subdistrict were met for the first time since 1984. On years with more normal chum migration timing, the

subsistence fishing closures enacted during 1991 would have virtually eliminated any chum harvest. The late run timing allowed some harvest after most escapement goals had been met. Once the bulk of the chum had past, subsistence regulations were liberalized to allow the harvest of other species. Sport fishing for chum salmon was closed throughout the entire season.

One hundred fifty-five subsistence permits were issued for the Nome area in 1991 as compared to the recent 5-year average (1986-1990) of 209. The reported harvests from the 128 permits returned was 83 chinook, 166 sockeye, 1,279 coho, 194 pink, and 3,715 chum salmon for a total of 5,652 fish (Table 2C). The total reported subsistence salmon harvest was 56% of the recent 5-year average of 10,030 (Appendix Table A2). This below average reported subsistence catch was due to both poor salmon returns and restrictive management actions.

Golovin - Subdistrict 2

The Golovin Subdistrict was opened by emergency order June 20 with a fishing schedule of two 48 hour periods per week (Table 5B). Sixteen fishermen sold 49 chinook, 1 sockeye, and 14,839 chum salmon. One domestic buyer operated for 5 periods, purchasing fish which were iced, flown to Nome and then on to Anchorage. The season closed by regulation August 31. One catcher seller operated for the same time period. The area manager was preparing to close the commercial chum salmon season when the buyer ceased operation.

Moses Point - Subdistrict 3

The Moses Point Subdistrict opened by emergency order on June 24 with a standard two 24 hour period schedule per week (Table 6C). The Department's counting tower on the Kwiniuk River showed chum salmon escapement was behind schedule which prompted an E.O. closing the Moses Point Subdistrict on June 27. The subdistrict reopened August 1, however no additional salmon were harvested due to lack of market. The season closed by regulation on August 31. Twenty-four fishermen harvested 161 chinook and 804 chum salmon. A domestic buyer flew the salmon out, iced, in-the-round to Fairbanks for processing.

Norton Bay - Subdistrict 4

No salmon were commercially harvested in the Norton Bay Subdistrict during the 1991 season due to the lack of a market.

Shaktoolik - Subdistrict 5

The Shaktoolik Subdistrict opened by emergency order on June 17 (Table 7C). Initial periods were set at 24 hours in length from June 17-21 (periods 1 and 2). On June 24, fishing time was increased to the standard two 48 hour periods per week which continued through the remainder of the season. Gill net mesh size was restricted to not more than six inches by E.O. on July 14. Another E.O. closed the subdistrict from July 18 through July 24 to allow additional chum salmon to

migrate to spawning areas. One domestic buyer conducted a fly-out operation where fish were flown to Unalakleet, iced, in-the-round, for transport to processing facilities and fresh markets in Anchorage. The Shaktoolik Subdistrict season closed by regulation on September 7, however fishing effort actually ended August 21 when fish buying operations ceased.

Twenty-five fishermen harvested 1,324 chinook, 55 sockeye, 11,614 coho, and 31,619 chum salmon for a combined total of 44,612 fish (Tables 1C and 7C). The chinook harvest was 15% and 35% below the previous 5 and 10 year average catches, respectively. The coho salmon harvest was 83% above the previous 5 year average catch and 42% above the previous 10 year average catch. The chum salmon harvest was 69% above and 24% above the previous 5 and 10 year average catches, respectively.

Unalakleet - Subdistrict 6

The Unalakleet Subdistrict receives the most fishing effort in Norton Sound, and has historically not had problems obtaining buyers for their salmon, with the exception of pinks.

The commercial fishing periods, openings, and closures in the Unalakleet Subdistrict were the same as those in the Shaktoolik Subdistrict because of their close proximity (shared boundary) and the difficulty in obtaining timely escapement information. The Fish and Game test net in the Unalakleet River was used as an index of salmon abundance and escapement in both Subdistricts 5 and 6. An additional E.O. closed the Unalakleet River upstream of the mouth of the South River from June 19 until July 8 in order to prevent the drifting of gill nets through king salmon milling areas. Table 8C summarizes commercial catch and effort data by period for the Unalakleet Subdistrict.

A total of 75 fishermen harvested 4,534 chinook, 147 sockeye, 52,033 coho, and 39,609 chum salmon for a combined total of 96,323 fish (Table 1C). The chinook salmon harvest was 11% above and 20% below the previous 5 and 10 year average catches, respectively. The coho harvest was 75% above the previous 5 year average catch and 53% above the previous 10 year average catch. The chum salmon harvest was 68% above and 4% above the previous 5 and 10 year average catches, respectively (Appendix Table A7).

One primary domestic buyer operated through nearly the entire season, pulling out August 31. Most of the salmon were flown out iced, in-the-round, to Anchorage bound for fresh markets or for further processing. The Norton Sound Fishermen's Co-op plant did not operate, however, this facility was leased to receive and ice the salmon delivered dockside. A second domestic buyer operated in the Unalakleet Subdistrict during peak periods for chinook and coho salmon. In addition, a few fishermen sold some of their catch to individuals and local businesses as permitted under the catcher-seller regulations.

Escapement

Table 3C lists aerial survey and tower escapement counts in the major index streams of Norton Sound. In general, weather and survey conditions were good

during most of the season. River water levels were moderate following the spring break up then gradually cleared, dropped, and remained low through both the chum and coho runs. Dense smoke reduced visibility on some surveys.

The Nome Subdistrict of Norton Sound received the most intensive survey efforts because salmon stocks local to the Nome area are limited, easily accessed by road system, and exposed to extensive subsistence and sport fishing pressure. Several aerial and boat surveys were conducted on the Nome River.

Chum salmon escapements in the Nome Subdistrict greatly improved over the last couple seasons as the result of drastic management action. The peak count of the Nome River was 3,520 chum. This was the first time since 1984 that the river exceeded it's goal of 2,000 chum salmon.

Chum salmon escapements in the Golovin Subdistrict streams were 15% below their total goal. The Moses Point Subdistrict rivers (Kwiniuk and Tubutulik) were again well below average. The Kwiniuk River had a preliminary expanded tower count of 18,802 chum salmon with an escapement goal of 25,000. The Tubutulik River had an aerial survey count of 7,085 with an escapement goal of 12,000 chum salmon. It is important to remember that the commercial harvest was also very low in the Moses Point Subdistrict.

Aerial surveys of the Inglutalik and Ungalik Rivers in the Norton Bay Subdistrict counted above average numbers of chum salmon. The Shaktoolik River count in Subdistrict 5 had a slightly low chum count, however large numbers of pinks may of masked counts. Comparative commercial catch data indicate an above average return of chum salmon to the Shaktoolik Subdistrict, therefore the assumption was made that an adequate escapement was reached.

Chum salmon escapement to the Unalakleet River system met their goals. Comparative commercial catch figures and the Department test net catches in the lower Unalakleet River indicated a low return which prompted the closure of two commercial periods. The closure and a late surge of fish resulted in increased numbers.

The Unalakleet and Shaktoolik Subdistricts of Norton Sound are the primary chinook salmon producers, although the Norton Bay, Moses Point and Golovin Subdistricts are gradually increasing chinook returns in recent years. Chinook escapement surveys observed average to above average numbers in most streams throughout the District. However the Department test net in the Unalakleet River and comparative commercial catch data indicate the chinook return was just below average overall.

Coho salmon are found in nearly all of the chum producing streams throughout the Norton Sound District with the major producers being the Unalakleet and Shaktoolik Subdistricts. Because of the inclement weather normally experienced in this area during August and September, escapement data for all subdistricts is somewhat sketchy. This year, peak coho salmon counts were obtained for most District streams under fair to good viewing conditions.

Overall, coho salmon escapements appeared to be good. Virtually all streams surveyed in Norton Sound were at or above average with the exceptions of Ophir

Creek and Eldorado River. The Department's test net and comparative commercial catch data also indicated a strong return.

Pink salmon escapements and returns were variable across Norton Sound. Aerial survey counts of pink salmon were below average. Pink salmon abundance in Norton Sound follows and odd/even year cycle with the even year returns much larger than odd year returns. However, pink salmon showed up stronger than expected in the southern streams which are typically on the same cycle (Table 3C).

Management Concerns

Once again chum salmon escapements in the Nome and Moses Point Subdistricts were of concern, or fell short of escapement goals. Escapement goals were reached for most Nome area streams, but only after extreme management actions were taken early in the season. While escapement goals were met, continued strict management will be necessary to rebuild chum salmon runs to levels that can sustain historic fisheries.

The chum salmon return to the Kwiniuk River in the Moses Point Subdistrict was 25% below the escapement goal even though only one 24 hour commercial period was allowed. The spring 1990 Board of Fish imposed a reduced fishing schedule for the subdistrict. In the past, reduced commercial fishing had worked to rebuild the stock from a similar low level. It now appears that it will take several years to rebuild the stock.

The Unalakleet Subdistrict has experienced a black market fishery for king salmon during the past 2 years. In order to maintain escapement, the commercial fishery has been cut back by delaying the opening and keeping fishing periods to 24 hours in length. Subsistence fishing was also restricted to the lower section of river to prevent the non-traditional seining of pools where kings mill. The illegal sale if king salmon as strips will continue
to be a matter of concern in upcoming years.

1992 Outlook

Forecasting commercial harvests of the various salmon species is difficult in Norton Sound due to differences in market from year to year. Harvests of chinook and coho salmon are expected to be near normal, that is 6-8,000 chinook and 20-40,000 coho. The pink salmon return is expected to be strong throughout Norton Sound, but no commercial market exists. Chum salmon represent the most difficult management problem in 1992. Chum runs in southern Norton Sound are below average, but commercial harvests of 30-60,000 are anticipated. The northern Norton Sound chum stocks are in their most seriously depressed cycle since statehood. Subdistrict 2 commercial harvests will be held to 10,000 chum unless adequate escapement and subsistence harvests can be anticipated. The situation is considerably worse in Subdistricts 1 and 3 where closures in subsistence fishing are anticipated and no commercial or sport harvests of chum salmon are anticipated. Limited subsistence harvests of chum will be allowed incidentally to the subsistence pink salmon harvest in Subdistricts 1 and 3.

Table 1A. Norton Sound commercial salmon catch by subdistrict, 1989.

Subdistrict	Chinook	Sockeye	Coho	Pink	Chum	Total
Nome	2	0	0	123	492	617
Golovin	0	0	0	0	0	0
Moses Point	62	0	0	0	1,667	1,729
Norton Bay	0	0	0	0	0	0
Shaktoolik	1,241	43	8,066	0	19,641	28,991
Unalakleet	4,402	222	36,025	0	20,825	61,474
District Totals	5,707	265	44,091	123	42,625	92,811

Table 1B. Norton Sound commercial salmon catch by subdistrict, 1990.

Subdistrict	Chinook	Sockeye	Coho	Pink	Chum	Total
Nome	0	0	0	0	0	0
Golovin	52	21	0	0	15,993	16,066
Moses Point	202	0	0	501	3,723	4,426
Norton Bay	0	0	0	0	0	0
Shaktoolik	2,644	49	4,695	0	21,748	29,136
Unalakleet	5,997	364	52,017	0	23,659	82,037
District Totals	8,895	434	56,712	501	65,123	131,665

Table 1C. Norton Sound commercial salmon catch by subdistrict, 1991.

Subdistrict	Chinook	Sockeye	Coho	Pink	Chum	Total
Nome	0	0	0	0	0	0
Golovin	49	1	0	0	14,839	14,889
Moses Point	161	0	0	0	804	965
Norton Bay	0	0	0	0	0	0
Shaktoolik	1,324	55	11,614	0	31,619	44,612
Unalakleet	4,534	147	52,033	0	39,609	96,323
District Totals	6,068	203	63,647	0	86,871	156,789

Table 2A. Nome (subdistrict 1) subsistence salmon catches, 1989.

Location	Permits Issued	Permits Returned	Permits Fished	Chinook	Sockeye	Coho	Pink	Chum	Total
Nome River	12	12	10	2	0	85	68	59	214
Marine Waters	70	67	45	18	91	258	534	2028	2929
Sinuk River	1	1	1	0	0	1	1	0	2
Eldorado River	18	18	11	0	33	50	223	1204	1510
Flambeau River	3	3	2	0	0	4	4	34	42
Snake River	8	8	7	1	3	22	10	16	52
Penny River	0	0	0	0	0	0	0	0	0
Solomon River	1	1	0	0	0	0	0	0	0
Feather River	0	0	0	0	0	0	0	0	0
Bonanza River	7	7	6	3	0	29	82	54	168
Cripple River	3	3	2	0	0	20	0	4	24
Safety Sound	1	1	1	0	0	0	2	0	2
Eld/Flam Rivers	0	0	0	0	0	0	0	0	0
Totals	124	121	85	24	127	469	924	3399	4943

Table 2B. Nome Subdistrict subsistence salmon catches, Norton Sound District, 1990.

Location	Permits Issued	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum	Total
Nome River	19	16	1	3	101	333	49	487
Marine Waters	86	71	49	83	118	775	2157	3182
Siniuk River	5	4	4	66	0	43	83	196
Eldorado River	24	20	2	92	47	208	1599	1948
Flambeau River	5	3	1	0	0	0	116	117
Snake River	14	12	1	2	69	233	22	327
Penny River	0	0	0	0	0	0	0	0
Solomon River	5	5	0	0	0	292	6	298
Bonanza River	10	9	0	79	62	46	120	307
Cripple River	1	1	0	0	12	7	1	20
Totals	169	141	58	325	409	1937	4153	6882

Table 2C. Nome (subdistrict 1) subsistence salmon catches, Norton Sound, 1991.

Location	Permits Issued	Permits Returned	Permits Fished	Chinook	Sockeye	Coho	Pink	Chum	Total
Marine Waters	76	63	48	69	41	628	111	3,143	3,992
Nome River	16	13	13	1	7	203	48	84	343
Snake River	6	4	3	0	0	41	1	6	48
Eldorado/Flambeau	11	9	5	3	4	198	9	325	539
Bonanza River	8	8	7	0	0	144	0	10	124
Solomon River	4	2	1	2	4	12	0	29	47
Safety Sound	1	1	1	0	0	44	0	0	44
Sinuk River	0	0	0	0	0	0	0	0	0
Other Rivers	1	1	1	0	0	5	0	20	25
Port Clarence	26	21	14	8	110	34	25	98	275
Unknown	6	6	0	0	0	0	0	0	0
Totals	155	128	93	83	166	1,279	194	3,715	5,437

"Other Rivers " include the Penny, Feather. Niukluk, and Fish Rivers.
"Port Clarence" include the Kuzitrine and Pilgrim Rivers, and Salmon Lake.
"Unknown Rivers" include data for which original permits or permit lists have been lost.
Data processed by Alaska Department of Fish and Game Subsistence Division.

Table 3A. Aerial survey counts of Norton Sound streams and associated chum salmon escapement goals, 1989.

Stream Name	Chinook	Coho	Sockeye	Pink	Chum	Chum Goal
Nome R.[c d]		377		13,085	541	2,000
Flambeau R.[a]						3,250
Eldorado R.	17	44		2,050	884	5,250
Sinuk R.[c d]		161		29,040	95	4,500
Solomon R.		25		1,370	60	
Fish R.						17,500
Niukluk R.[d]		170			6,200	8,000
Boston Cr.[d]				8,440	1,455	2,500
Tubutulik R.[c d]	397			186,400	4,350	12,000
Kwiniuk R.	248[b]			27,487[b]	14,282[b]	25,000
Ungalik R.[c d]	20			32,420	2,313	
Inglutalik R.[a]						
Shaktoolik R.[c d]	365			22,790	1,675	11,000
North R.[c d]	255			25,685	1,345	2,000
Unalakeet R.[c d]	458			19,670	2,580	

[a] Not Surveyed.
[b] Expanded tower counts.
[c] Peak coho salmon count obtained by adding upper river boat survey count on 9/01 to lower river count on 9/02.
[d] Includes 474 coho salmon counted in Ophir Creek.

Table 3B. Aerial survey counts of Norton Sound streams and associated chum salmon escapement goals, 1990.

Stream Name	Chinook	Coho	Sockeye	Pink	Chum	Chum Goal
Salmon L.			3,875			
Sinuk R.[c d]		161		29,040	95	4,500
Glacial L.			639			
Snake R.		617				
Nome R.[c d]		377		13,085	541	2,000
Eldorado R.	17	44		2,050	884	5,250
Flambeau R.[a]						3,250
Fish R.						17,500
Boston Cr.[d]				8,440	1,455	2,500
Niukluk R.[d]		170			6,200	8,000
Ophir Cr.		194				
Kwiniuk R.	900[b]	746		416,511[b]	13,957[b]	25,000
Tubutulik R.[c d]	397			186,400	4,350	12,000
Ungalik R.[c d]	20			32,420	2,313	
Shaktoolik R.[c d]	365			22,790	1,675	11,000
Unalakeet R.[c d]	458			19,670	2,580	
North R.[c d]	255			25,685	1,345	2,000
Old Woman R.[d]	211			3,295	510	

[a] Not surveyed.
[b] Expanded tower counts.
[c] Species identifiction problem due to numerous pink salmon; pink count may include some chum salmon.
[d] Peak chum salmon counts.

Table 3C. Aerial survey counts of Norton Sound streams and associated chum salmon escapement goals, 1991.

Stream Name	Chinook	Coho	Sockeye	Pink	Chum	Chum Goal
Grand Central R.			1,520			
Salmon L.			4,173			
Pilgrim R.	5			103		
Sinuk R.	3	701		14,680	5,420	4,500
Glacial L.			2,141			
Cripple R.		195		470	2,090	
Penny R.		60		300		
Snake R.				190	772	1,000
Nome R.	9	611		4,690	3,520	2,000
Flambeau R.	2			570	1,564	3,250
Eldorado R.	76	98		1,590	5,755	5,250
Bonanza R.				2,980	1,520	1,500
Solomon R.		171		3,640	830	550
Fish R.	58			51,190	10,470	17,500
Niuluk R.	24	1,783		37,410	10,660	8,000
Boston R.	152			3,210	2,550	2,500
Kwiniuk R.	587[a]	809		54,591[a]	18,802[a]	25,000[a]
Tubutulik R.	661			26,870	7,085	12,000
Inglutalik R.	551			94,100	16,250	8,500
Ungalik R.	151	418		152,900	10,050	2,500
Shaktoolik R.	730	3,427		208,070	7,405	11,000
Unalakleet R.	1,244	7,396		44,300	4,225	
North R.	656	2,510		118,720	2,435	2,000
Old Woman R.	389	1,530		1,964	990	100
Kogok R.		177		620	1,350	
Pikmiktalik R.	154	1,202		2,480	1,360	

[a] Tower count.

Table 4. Commercial salmon catches from Nome, subdistrict 1, Norton Sound, set gill nets, 1989.

	Period Dates	Hours Fished	No. of Fisherman	Period Catch and Catch Per Unit Effort 1/						Cumulative Catch and Catch Per Unit Effort					
				CHINOOK	CPUE	PINK	CPUE	CHUM	CPUE	CHINOOK	CPUE	PINK	CPUE	CHUM	CPUE
01	7/03-7/04	24	2	1	0.00	88	1.83	285	5.94	1	0.01	88	1.83	285	5.94
02	7/06-7/07	24	1	1	0.00	35	1.46	207	8.60	2	0.01	123	1.70	492	6.80
03	7/10-7/11	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
04	7/13-7/14	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
05	7/17-7/18	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
06	7/20-7/21	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
07	7/24-7/25	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
08	7/27-7/28	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
09	7/31-8/01	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
10	8/03-8/04	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
11	8/07-8/08	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
12	8/10-8/11	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
13	8/14-8/15	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
14	8/17-8/18	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
15	8/21-8/22	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
16	8/24-8/25	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
17	8/28-8/29	24	0	NO BUYER						2	0.01	123	1.70	492	6.80
Season Total		48 2/	2	2		123		492		2		123		492	

1/ No sockeye or coho salmon were sold.
2/ Total hours actually fished.

Table 5A. Commercial salmon catches from Golovin, subdistrict 2, Norton Sound, set gill nets, 1990.

Period Number	Period Dates	Hours Fished	No. of Fishermen		Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
					Chinook	CPUE	Sockeye	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	CPUE	Chum	CPUE
1	6/22-6/23	24	0	No Buyer												
2	6/25-6/27	48	10		19	0.04	0	0.00	4,857	10.12	19	0.04	0	0.00	4,857	10.12
3	6/28-6/30	48	14		21	0.03	8	0.01	6,410	9.54	40	0.03	8	0.01	11,267	9.78
4	7/02-7/04	48	15		12	0.02	13	0.02	4,726	8.54	52	0.03	21	0.02	15,993	8.54
5	7/05-7/07	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
6	7/09-7/11	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
7	7/12-7/14	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
8	7/16-7/18	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
9	7/19-7/21	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
10	7/23-7/25	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
11	7/26-7/28	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
12	7/30-8/01	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
13	8/02-8/04	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
14	8/06-8/08	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
15	8/09-8/11	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
16	8/13-8/15	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
17	8/16-8/18	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
18	8/20-8/22	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
19	8/23-8/25	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
20	8/27-8/29	48	0	No Buyer							52	0.03	21	0.02	15,993	8.54
21	8/30-8/31	24	0	No Buyer							52	0.03	21	0.02	15,993	8.54

No coho salmon were sold.
Total hours actually fished = 100
Total number of permits used = 15

Table 58. Commercial salmon catches from Golovin, subdistrict 2, Norton Sound, set gill nets, 1991.

Period Number	Period Dates	Hours Fished	No. of Fishermen		Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
					Chinook	CPUE	Sockeye	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	CPUE	Chum	CPUE
1	6/20-6/22	48	3		7	0.05	1		586	4.07	7	0.05	1		586	4.07
2	6/24-6/26	48	10		8	0.02	0		2,557	5.33	15	0.02	1		3,143	5.04
3	6/27-6/29	48	11		21	0.04	0		2,927	5.54	36	0.03	1		6,070	5.27
4	7/01-7/03	48	14		11	0.02	0		4,920	7.32	47	0.03	1		10,990	6.03
5	7/04-7/06	48	13		2	+	0		3,849	6.17	49	0.02	1		14,839	6.06
6	7/08-7/10	48	0	No Buyer							49	0.03	1		14,839	5.83
7	7/11-7/13	48	0	No Buyer							49	0.03	1		14,839	5.83
8	7/15-7/17	48	0	No Buyer							49	0.03	1		14,839	5.83
9	7/18-7/20	48	0	No Buyer							49	0.03	1		14,839	5.83
10	7/22-7/24	48	0	No Buyer							49	0.03	1		14,839	5.83
11	7/25-7/27	48	0	No Buyer							49	0.03	1		14,839	5.83
12	7/29-7/31	48	0	No Buyer							49	0.03	1		14,839	5.83
13	8/01-8/03	48	0	No Buyer							49	0.03	1		14,839	5.83
14	8/05-8/07	48	0	No Buyer							49	0.03	1		14,839	5.83
15	8/08-8/10	48	0	No Buyer							49	0.03	1		14,839	5.83
16	8/12-8/14	48	0	No Buyer							49	0.03	1		14,839	5.83
17	8/15-8/17	48	0	No Buyer							49	0.03	1		14,839	5.83
18	8/19-8/21	48	0	No Buyer							49	0.03	1		14,839	5.83
19	8/22-8/24	48	0	No Buyer							49	0.03	1		14,839	5.83
20	8/26-8/28	48	0	No Buyer							49	0.03	1		14,839	5.83
21	8/29-8/31	24	0	No Buyer							49	0.03	1		14,839	5.83

No coho salmon were sold.
Total hours actually fished = 240
Total number of permits used = 16

Table 6A. Commercial salmon catches from Moses Point, subdistrict 3, Norton Sound, set gill nets, 1989.

	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort 1/2/ CHINOOK	CPUE	CHUM	CPUE	Cumulative Catch and Catch Per Unit Effort CHINOOK	CPUE	CHUM	CPUE
01	6/29-6/30	24	13	62	0.20	1,667	5.34	62	0.20	1,667	5.34
02	7/03-7/04	24	0	NO BUYER				62	0.20	1,667	5.34
03	7/06-7/07	24	0	NO BUYER				62	0.20	1,667	5.34
04	7/10-7/11	24	0	NO BUYER				62	0.20	1,667	5.34
05	7/31-8/02	48	0	REOPEN BY E. O. NO BUYER				62	0.20	1,667	5.34
06	8/03-8/05	48	0	NO BUYER				62	0.20	1,667	5.34
07	8/07-8/09	48	0	NO BUYER				62	0.20	1,667	5.34
08	8/10-8/12	48	0	NO BUYER				62	0.20	1,667	5.34
09	8/14-8/16	48	0	NO BUYER				62	0.20	1,667	5.34
10	8/17-8/19	48	0	NO BUYER				62	0.20	1,667	5.34
11	8/21-8/23	48	0	NO BUYER				62	0.20	1,667	5.34
12	8/24-8/26	48	0	NO BUYER				62	0.20	1,667	5.34
13	8/28-8/31	48	0	NO BUYER				62	0.20	1,667	5.34
Season Total		24 3/	13	62				62		1,667	

1/ Closed by emergency order from 7/13-7/31/89.
2/ No sockeye, coho, or pink salmon were sold.
3/ Total hours actually fished

Table 6B. Commercial salmon catches from Moses Point, subdistrict 3, Norton Sound, set gill nets, 1990.

Period Number	Period Dates	Hours Fished	No. of Fishermen		Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
					Chinook	CPUE	Pink	CPUE	Chum	CPUE	Chinook	CPUE	Pink	CPUE	Chum	CPUE
1	6/25-6/26	24	16		110	0.29			1339	3.49	110	0.29			1339	3.49
2	6/28-6/29	24	19		83	0.18			1641	3.6	193	0.23			2980	3.55
3	7/02-7/03	24	0	No Buyer							193	0.23			2980	3.55
4	7/05-7/06	24	0	No Buyer							193	0.23			2980	3.55
5	7/09-7/10	24	16			0.02			733	1.91	202	0.17			3713	3.03
6	7/12-7/13	24	0	No Buyer							202	0.17			3713	3.03
7	7/16-7/17	24	2				501	1.56	10	0.21	202	0.17	501	1.56	3723	2.93
8	7/19-7/20	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
9	7/23-7/24	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
10	7/26-7/27	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
11	7/30-7/31	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
12	8/02-8/03	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
13	8/06-8/07	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
14	8/09-8/10	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
15	8/13-8/14	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
16	8/16-8/17	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
17	8/20-8/21	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
18	8/23-8/24	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
19	8/27-8/28	24	0	No Buyer							202	0.17	501	1.56	3723	2.93
20	8/30-8/31	24	0	No Buyer							202	0.17	501	1.56	3723	2.93

No coho salmon were sold.
Total hours actually fished = 96
Total number of permits used = 23

Table 6C. Commercial salmon catches from Moses Point, subdistrict 3, Norton Sound, set gill nets, 1991.

				Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
Period Number	Period Dates	Hours Fished	No. of Fishermen	Chinook	CPUE	Pink	CPUE	Chum	CPUE	Chinook	CPUE	Pink	CPUE	Chum	CPUE
1	6/24-6/25	24	24	161	0.28			804	1.4	161	0.28			804	1.4
2	6/27-6/28	0	Closed by E. O.							161	0.28			804	1.4
3	7/01-7/02	0	Closed by E. O.							161	0.28			804	1.4
4	7/04-7/05	0	Closed by E. O.							161	0.28			804	1.4
5	7/08-7/09	0	Closed by E. O.							161	0.28			804	1.4
6	7/11-7/12	0	Closed by E. O.							161	0.28			804	1.4
7	7/15-7/16	0	Closed by E. O.							161	0.28			804	1.4
8	7/18-7/19	0	Closed by E. O.							161	0.28			804	1.4
9	7/22-7/23	0	Closed by E. O.							161	0.28			804	1.4
10	7/25-7/26	0	Closed by E. O.							161	0.28			804	1.4
11	7/29-7/30	0	Closed by E. O.							161	0.28			804	1.4
12	8/01-8/03	48	Reopen by E. O.		No Buyer					161	0.28			804	1.4
13	8/05-8/07	48	No Buyer							161	0.28			804	1.4
14	8/08-8/10	48	No Buyer							161	0.28			804	1.4
15	8/12-8/14	48	No Buyer							161	0.28			804	1.4
16	8/15-8/17	48	No Buyer							161	0.28			804	1.4
17	8/19-8/21	48	No Buyer							161	0.28			804	1.4
18	8/22-8/24	48	No Buyer							161	0.28			804	1.4
19	8/26-8/28	48	No Buyer							161	0.28			804	1.4
20	8/29-8/31	48	No Buyer							161	0.28			804	1.4

No coho salmon were sold.
Total hours actually fished = 24
Total number of permits used = 24

Table 7A. Commercial salmon catches from Shaktoolik, subdistrict 5, Norton Sound, set gill nets, 1989.

	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort 1/								Cumulative Catch and Catch Per Unit Effort 2/							
				CHINOOK	CPUE	SOCKEYE	CPUE	COHO	CPUE	CHUM	CPUE	CHINOOK	CPUE	SOCKEYE	CPUE	COHO	CPUE	CHUM	CPUE
01	6/15-6/16	24	17	184	0.45	0	0.00	0	0.00	51	0.12	184	0.45	0	0.00	0	0.00	51	0.12
02	6/19-6/20	24	21	360	0.71	0	0.00	0	0.00	339	0.67	544	0.60	0	0.00	0	0.00	390	0.42
03	6/22-6/24	48	20	136	0.14	0	0.00	0	0.00	881	0.91	680	0.36	0	0.00	0	0.00	1,271	0.67
04	6/26-6/28	48	22	324	0.31	0	0.00	0	0.00	5,197	4.92	1,004	0.34	0	0.00	0	0.00	6,468	2.20
05	6/29-7/01	48	24	115	0.10	9	(+)	0	0.00	2,951	2.56	1,119	0.27	9	(+)	0	0.00	9,419	2.30
06	7/03-7/05	48	19	64	0.07	4	(+)	0	0.00	4,018	4.41	1,183	0.23	13	(+)	0	0.00	13,437	2.69
07	7/06-7/08	48	18	26	0.03	4	(+)	0	0.00	1,959	2.27	1,209	0.20	17	(+)	0	0.00	15,396	2.63
08	7/10-7/12	48	10	8	0.02	4	(+)	0	0.00	662	1.38	1,217	0.19	21	(+)	0	0.00	16,058	2.53
09	7/13-7/15	48	9	5	0.01	0	0.00	3	(+)	322	0.75	1,222	0.18	21	(+)	3	(+)	16,380	2.42
10	7/17-7/19	48	7	1	(+)	0	0.00	6	(+)	288	0.86	1,223	0.18	21	(+)	9	(+)	16,668	2.34
11	7/20-7/22	48	13	5	(+)	4	(+)	120	0.19	616	0.99	1,228	0.15	25	(+)	129	0.20	17,284	2.23
12	7/24-7/26	48	0	NO BUYER								1,228	0.15	25	(+)	129	0.20	17,284	2.23
13	7/27-7/29	48	16	4	(+)	4	(+)	999	1.30	1,161	1.51	1,232	0.15	29	(+)	1,128	0.81	18,445	2.17
14	7/31-8/02	48	18	4	(+)	1	(+)	2,135	2.47	580	0.67	1,236	0.15	30	(+)	3,263	1.51	19,025	2.03
15	8/03-8/05	48	6	0	0.00	0	0.00	543	1.89	127	0.44	1,236	0.12	30	(+)	3,806	1.55	19,152	1.98
16	8/07-8/09	48	20	2	(+)	1	(+)	2,195	2.29	190	0.20	1,238	0.12	31	(+)	6,001	1.76	19,342	1.83
17	8/10-8/12	48	12	3	(+)	0	0.00	844	1.47	77	0.13	1,241	0.11	31	(+)	6.845	1.72	19,419	1.77
18	8/14-8/16	48	16	0	0.00	10	0.01	808	1.05	170	0.22	1,241	0.11	41	(+)	7,653	1.61	19,589	1.64
19	8/17-8/19	48	9	0	0.00	2	(+)	413	0.96	52	0.12	1,241	0.10	43	(+)	8,066	1.50	19,641	1.60
20	8/21-8/23	48	0	NO BUYER								1,241	0.10	43	(+)	8,066	1.50	19,641	1.60
21	8/24-8/26	48	0	NO BUYER								1,241	0.10	43	(+)	8,066	1.50	19,641	1.60
22	8/28-8/30	48	0	NO BUYER								1,241	0.10	43	(+)	8,066	1.50	19,641	1.60
23	8/31-9/02	48	0	NO BUYER								1,241	0.10	43	(+)	8,066	1.50	19,641	1.60
24	9/04-9/06	48	0	NO BUYER								1,241	0.10	43	(+)	8,066	1.50	19,641	1.60
Season Totals		816 3/	26	1,241		43		8,066		19,641		1,241		43		8,066		19,641	

1/ No pink salmon were sold.
2/ Cumulative coho boat hours began when 100 coho were caught.
3/ Total hours actually fished.

Table 78. Commercial salmon catches from Shaktoolik, subdistrict 5, Norton Sound, set gill nets, 1990.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort						
				Chinook	CPUE	Sockeye	CPUE	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	6/14-6/15	24	15	225	0.63		0.00			39	0	225	1				39	0
2	6/18-6/19	24	17	419	1.03		0.00			169	0	644	1				208	0
3	6/21-6/23	48	21	863	0.86		0.00			861	1	1,507	1				1,069	1
4	6/25-6/27	48	20	554	0.58		0.00			1,795	2	2,061	1				2,864	1
5	6/28-6/30	48	19	360	0.39	1	0.00			4,844	5	2,421	1	1			7,708	2
6	7/02-7/04	48	23	118	0.11	3	0.00			3,644	3	2,539	1	4			11,352	2
7	7/05-7/07	48	19	47	0.05	10	0.01			2,958	3	2,586	0	14			14,310	3
8	7/09-7/11	48	18	34	0.04	3	0.00	2	0	3,971	5	2,620	0	17	2		18,281	3
9	7/12-7/14	48	7	3	0.01		0.00			440	1	2,623	0	17	2		18,721	3
10	7/16-7/18	48	0	No Buyer								2,623	0	17	2		18,721	3
11	7/19-7/21	48	9	2	0.00	3	0.01	73	0	594	1	2,625	0	20	75		19,315	3
12	7/23-7/25	48	12	2	0.00	3	0.01	181	0	863	1	2,627	0	23	256	0	20,178	3
13	7/26-7/28	48	11	4	0.01	2	0.00	269	1	645	1	2,631	0	25	525	0	20,823	2
14	7/30-8/01	48	12	3	0.01		0.00	180	0	207	0	2,634	0	25	705	0	21,030	2
15	8/02-8/04	48	10	1	0.00	3	0.01	401	1	200	0	2,635	0	28	1,106	1	21,230	2
16	8/06-8/08	48	16	2	0.00	7	0.01	1,019	1	163	0	2,637	0	35	2,125	1	21,393	2
17	8/09-8/11	48	13	3	0.00	4	0.01	640	1	134	0	2,640	0	39	2,765	1	21,527	2
18	8/13-8/15	48	14	4	0.01	10	0.01	1,401	2	179	0	2,644	0	49	4,166	1	21,706	2
19	8/16-8/18	48	10	0	0.00		0.00	529	1	42	0	2,644	0	49	4,695	1	21,748	2
20	8/20-8/22	48	0	No Buyer								2,644	0	49	4,695	1	21,748	2
21	8/23-8/25	48	0	No Buyer								2,644	0	49	4,695	1	21,748	2
22	8/27-8/29	48	0	No Buyer								2,644	0	49	4,695	1	21,748	2
23	8/30-9/01	48	0	No Buyer								2,644	0	49	4,695	1	21,748	2
24	9/03-9/05	48	0	No Buyer								2,644	0	49	4,695	1	21,748	2
25	9/06-9/08	48	0	No Buyer								2,644	0	49	4,695	1	21,748	2

No pink salmon were sold.
Total hours actually fished = 816
Total number of permits used = 28
Cumulative coho boat hours began when 100 coho were caught.

Table 7C. Commercial salmon catches from Shaktoolik, subdistrict 5, Norton Sound, set gill nets, 1991.

				Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort						
Period Number	Period Dates	Hours Fished	No. of Fishermen	Chinook	CPUE	Sockeye	CPUE	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	6/17-6/18	24	19	259	0.57					73	0.16	259	0.57				73	0.16
2	6/20-6/21	24	19	373	0.82					114	0.25	632	0.69				187	0.21
3	6/24-6/26	48	20	285	0.30	7	0.01			1,743	1.82	917	0.49	7			1,930	1.03
4	6/27-6/29	48	21	205	0.20	8	0.01			5,806	5.76	1,122	0.39	15			7,736	2.69
5	7/01-7/03	48	18	91	0.11	0	0.00			2,796	3.24	1,213	0.32	15			10,532	2.81
6	7/04-7/06	48	16	46	0.06	2	0.00			4,301	5.60	1,259	0.28	17			14,833	3.29
7	7/08-7/10	48	16	24	0.03	8	0.01			5,690	7.41	1,283	0.24	25			20,523	3.89
8	7/11-7/13	48	19	18	0.02	7	0.01	1	0.00	4,169	4.57	1,301	0.21	32	1		24,692	3.99
9	7/15-7/17	48	15	8	0.01	1	0.00	2	0.00	1,299	1.80	1,309	0.19	33	3		25,991	3.76
10	7/18-7/20	0	0	Closed by E.O.								1,309	0.19	33	3		25,991	3.76
11	7/22-7/24	0	0	Closed by E.O.								1,309	0.19	33	3		25,991	3.76
12	7/25-7/27	48	15	1	0.00	4	0.01	311	0.43	1,405	1.95	1,310	0.17	37	314	0.44	27,396	3.59
13	7/29-7/31	48	12	0	0.00	5	0.01	1,173	2.04	846	1.47	1,310	0.16	42	1,487	1.15	28,242	3.44
14	8/01-8/03	48	15	3	0.00	1	0.00	1,518	2.11	791	1.10	1,313	0.15	43	3,005	1.49	29,033	3.25
15	8/05-8/07	48	18	1	0.00	5	0.01	2,392	2.77	1,072	1.24	1,314	0.13	48	5,397	1.87	30,105	3.07
16	8/08-8/10	48	17	1	0.00	1	0.00	2,967	3.64	850	1.04	1,315	0.12	49	8,364	2.26	30,955	2.92
17	8/12-8/14	48	17	1	0.00	2	0.00	1,001	1.23	237	0.29	1,316	0.12	51	9,365	2.08	31,192	2.73
18	8/15-8/17	48	12	0	0.00	2	0.00	1,381	2.40	251	0.44	1,316	0.11	53	10,746	2.11	31,443	2.62
19	8/19-8/21	48	9	8	0.02	2	0.00	868	2.01	176	0.41	1,324	0.11	55	11,614	2.10	31,619	2.54
20	8/22-8/24	48	0	No Buyer								1,324	0.11	55	11,614	2.10	31,619	2.54
21	8/26-8/28	48	0	No Buyer								1,324	0.11	55	11,614	2.10	31,619	2.54
22	8/29-8/31	48	0	No Buyer								1,324	0.11	55	11,614	2.10	31,619	2.54
23	9/02-9/04	48	0	No Buyer								1,324	0.11	55	11,614	2.10	31,619	2.54
24	9/05-9/07	48	0	No Buyer								1,324	0.11	55	11,614	2.10	31,619	2.54

No pink salmon were sold.
Total hours actually fished = 672
Total number of permits used = 25
Cumulative coho boat hours began when 100 coho were caught.

Table 8A. Commercial salmon catches from Unalakleet, subdistrict 6, Norton Sound, set gill nets, 1989.

	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort 1/								Cumulative Catch and Catch Per Unit Effort 2/							
				CHINOOK	CPUE	SOCKEYE	CPUE	COHO	CPUE	CHUM	CPUE	CHINOOK	CPUE	SOCKEYE	CPUE	COHO	CPUE	CHUM	CPUE
01	6/15-6/16	24	47	756	0.67	0	0.00	0	0.00	124	0.11	756	0.67	0	0.00	0	0.00	124	0.11
02	6/19-6/20	24	55	1,424	1.08	0	0.00	0	0.00	316	0.24	2,180	0.89	0	0.00	0	0.00	440	0.18
03	6/22-6/24	48	56	858	0.31	0	0.00	0	0.00	601	0.22	3,038	0.59	0	0.00	0	0.00	1,041	0.20
04	6/26-6/28	48	49	864	0.37	11	(+)	0	0.00	1,934	0.82	3,902	0.52	11	0.00	0	0.00	2,975	0.40
05	6/29-7/01	48	34	198	0.12	0	0.00	0	0.00	713	0.43	4,100	0.44	11	0.00	0	0.00	3,688	0.40
06	7/03-7/05	48	17	111	0.14	5	(+)	0	0.00	3,030	3.71	4,211	0.42	16	0.00	0	0.00	6,718	0.68
07	7/06-7/08	48	19	46	0.05	10	(+)	0	0.00	2,655	2.90	4,257	0.39	26	0.00	0	0.00	9,373	0.86
08	7/10-7/12	48	21	58	0.06	13	0.01	1	0.00	2,375	2.36	4,315	0.36	39	0.00	1	(+)	11,748	0.99
09	7/13-7/15	48	22	26	0.02	9	0.01	10	0.01	2,018	1.91	4,341	0.58	48	0.00	11	(+)	13,766	1.86
10	7/17-7/19	48	17	7	0.01	2	(+)	54	0.07	742	0.91	4,348	0.52	50	0.00	65	(+)	14,508	1.77
11	7/20-7/22	48	20	8	0.01	4	(+)	197	0.21	694	0.72	4,356	0.47	54	0.00	262	0.27	15,202	1.66
12	7/24-7/26	48	23	6	(+)	5	(+)	973	0.88	876	0.79	4,362	0.47	59	0.00	1,235	0.60	16,078	1.56
13	7/27-7/29	48	36	5	(+)	2	(+)	1,821	1.05	829	0.48	4,367	0.47	61	0.00	3,056	0.81	16,907	1.41
14	7/31-8/02	48	48	6	(+)	21	0.01	4,783	2.08	1,013	0.44	4,373	0.30	82	0.00	7,839	1.28	17,920	1.25
15	8/03-8/05	48	42	4	(+)	25	0.01	8,179	4.06	1,188	0.59	4,377	0.26	107	0.00	16,018	1.97	19,108	1.17
16	8/07-8/09	48	48	5	(+)	10	(+)	3,938	1.71	481	0.21	4,382	0.23	117	0.00	19,956	1.91	19,589	1.05
17	8/10-8/12	48	40	3	(+)	12	(+)	2,485	1.29	271	0.14	4,385	0.21	129	0.00	22,441	1.82	19,860	0.97
18	8/14-8/16	48	42	3	(+)	19	0.01	5,668	2.81	400	0.20	4,388	0.19	148	0.00	28,109	1.96	20,260	0.90
19	8/17-8/19	48	34	2	(+)	6	(+)	2,335	1.43	159	0.10	4,390	0.18	154	0.00	30,444	1.90	20,419	0.84
20	8/21-8/23	48	34	3	(+)	13	0.01	1,912	1.17	150	0.09	4,393	0.17	167	0.00	32,356	1.84	20,569	0.80
21	8/24-8/26	48	35	3	(+)	15	0.01	1,173	0.70	105	0.06	4,396	0.16	182	0.00	33,529	1.74	20,674	0.77
22	8/28-8/30	48	26	4	(+)	19	0.02	1,380	1.11	86	0.07	4,400	0.15	201	0.00	34,909	1.70	20,760	0.73
23	8/31-9/02	48	19	0	0.00	16	0.02	525	0.58	35	0.04	4,400	0.15	217	0.00	35,434	1.65	20,795	0.71
24	9/04-9/06	48	14	2	(+)	5	(+)	591	0.88	30	0.04	4,402	0.15	222	0.00	36,025	1.63	20,825	0.70
Season Total		1152 3/	73	4,402		222		36,025		20,825		4,402		222		36,025		20,825	

1/ No pink salmon were sold.
2/ Cumulative coho boat hours began when 100 coho were caught.
3/ Total hours actually fished.

Table 8B. Commercial salmon catches from Unalakleet, subdistrict 6, Norton Sound, set gill nets, 1990.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort						
				Chinook	CPUE	Sockeye	CPUE	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	6/14-6/15	24	31	515	0.69		0.00			28	0.04	515	0.69				28	0.04
2	6/18-6/19	24	33	743	0.94		0.00			93	0.12	1,258	0.82				121	0.08
3	6/21-6/23	48	43	2,037	0.99		0.00			1,174	0.57	3,295	0.92				1,295	0.36
4	6/25-6/27	48	55	1,437	0.54	2	0.00			1,844	0.70	4,732	0.76				3,139	0.50
5	6/28-6/30	48	55	808	0.31	5	0.00			1,807	0.68	5,540	0.62	1			4,946	0.56
6	7/02-7/04	48	33	189	0.12	56	0.04			2,622	1.66	5,729	0.55	57			7,568	0.72
7	7/05-7/07	48	31	76	0.05	34	0.02	2	0.00	2,761	1.86	5,805	0.49	91			10,329	0.86
8	7/09-7/11	48	31	52	0.03	11	0.01	2	0.00	3,088	2.08	5,857	0.44	102	2		13,417	1.00
9	7/12-7/14	48	22	25	0.02	2	0.00	2	0.00	1,475	1.40	5,882	0.41	104	4		14,892	1.03
10	7/16-7/18	48	26	17	0.01	12	0.01	62	0.05	2,094	1.68	5,899	0.37	116	66		16,986	1.08
11	7/19-7/21	48	23	14	0.01	7	0.01	152	0.14	1,461	1.32	5,913	0.35	123	218	0.20	18,447	1.09
12	7/23-7/25	48	26	10	0.01	5	0.00	596	0.48	917	0.73	5,923	0.33	128	814	0.65	19,364	1.07
13	7/26-7/28	48	24	9	0.01	10	0.01	690	0.60	597	0.52	5,932	0.31	138	1,504	0.63	19,961	1.04
14	7/30-8/01	48	29	6	0.00	10	0.01	1,360	0.98	493	0.35	5,938	0.29	148	2,864	0.76	20,454	0.99
15	8/02-8/04	48	39	12	0.01	46	0.02	4,980	2.66	773	0.41	5,950	0.26	194	7,844	1.38	21,227	0.94
16	8/06-8/08	48	44	14	0.01	51	0.02	8,254	3.91	707	0.33	5,964	0.24	245	16,098	2.07	21,934	0.89
17	8/09-8/11	48	51	5	0.00	17	0.01	6,023	2.46	429	0.18	5,969	0.22	262	22,121	2.16	22,363	0.83
18	8/13-8/15	48	43	9	0.00	17	0.01	9,716	4.71	544	0.26	5,978	0.21	279	31,837	2.59	22,907	0.79
19	8/16-8/18	48	34	4	0.00	15	0.01	6,860	4.20	257	0.16	5,982	0.19	294	38,697	2.78	23,164	0.75
20	8/20-8/22	48	45	2	0.00	18	0.01	6,579	3.05	234	0.11	5,984	0.18	312	45,276	2.82	23,398	0.71
21	8/23-8/25	48	34	13	0.01	25	0.02	3,956	2.42	177	0.11	5,997	0.17	337	49,232	2.78	23,575	0.68
22	8/27-8/29	48	13	1	0.00	16	0.03	1,987	3.18	70	0.11	5,998	0.17	353	51,219	2.79	23,645	0.67
23	8/30-9/01	48	18	0	0.00	1	0.00	549	0.64	10	0.01	5,998	0.17	354	51,768	2.70	23,655	0.66
24	9/03-9/05	48	11	0	0.00	4	0.01	247	0.47	4	0.01	5,998	0.16	358	52,015	2.64	23,659	0.65
25	9/06-9/08	48	0									5,998	0.16	358	52,015	2.64	23,659	0.65

No pink salmon were sold.
Total hours fished = 1,152
Total number of permits used = 73
Cumulative coho boat hours began when 100 coho were caught.

Table 8C. Commercial salmon catches from Unalakleet, subdistrict 6, Norton Sound, set gill nets, 1991.

				Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort						
Period Number	Period Dates	Hours Fished	No. of Fishermen	Chinook	CPUE	Sockeye	CPUE	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	6/17-6/18	24	46	1,098	0.99		0.00			135	0.12	1,098	0.99				135	0.12
2	6/20-6/21	24	47	582	0.52		0.00			82	0.07	1,680	0.75				217	0.10
3	6/24-6/26	48	52	979	0.39	2	0.00			605	0.24	2,659	0.56	2			822	0.17
4	6/27-6/29	48	56	1,074	0.40	2	0.00			2,569	0.96	3,733	0.50	4			3,391	0.46
5	7/01-7/03	48	51	551	0.23	1	0.00			2,299	0.94	4,284	0.43	5			5,690	0.58
6	7/04-7/06	48	29	101	0.07	0	0.00			2,655	1.91	4,385	0.39	5			8,345	0.74
7	7/08-7/10	48	33	43	0.03	4	0.00			3,118	1.97	4,428	0.34	9			11,463	0.89
8	7/11-7/13	48	31	34	0.02	22	0.01			4,892	3.29	4,462	0.31	31			16,355	1.14
9	7/15-7/17	48	34	15	0.01	19	0.01	13	0.01	6,172	3.78	4,477	0.28	50	13		22,527	1.41
10	7/18-7/20	0	0	CLOSED BY E.O.								4,477	0.28	50	13		22,527	1.41
11	7/22-7/24	0	0	CLOSED BY E.O.								4,477	0.28	50	13		22,527	1.41
12	7/25-7/27	48	36	5	0.00	8	0.00	1,606	0.93	4,438	2.57	4,482	0.25	58	1,619	0.94	26,965	1.52
13	7/29-7/31	48	43	10	0.00	13	0.01	3,061	1.48	2,769	1.34	4,492	0.23	71	4,680	1.23	29,734	1.51
14	8/01-8/03	48	43	0	0.00	6	0.00	4,416	2.14	2,358	1.14	4,492	0.21	77	9,096	1.55	32,092	1.47
15	8/05-8/07	48	45	7	0.00	6	0.00	9,000	4.17	2,217	1.03	4,499	0.19	83	18,096	2.26	34,309	1.43
16	8/08-8/10	48	45	2	0.00	6	0.00	9,161	4.24	1,916	0.89	4,501	0.17	89	27,257	2.68	36,225	1.39
17	8/12-8/14	48	51	4	0.00	8	0.00	6,533	2.67	945	0.39	4,505	0.16	97	33,790	2.68	37,170	1.30
18	8/15-8/17	48	47	1	0.00	6	0.00	5,164	2.29	879	0.39	4,506	0.15	103	38,954	2.62	38,049	1.23
19	8/19-8/21	48	46	10	0.00	8	0.00	6,634	3.00	976	0.44	4,516	0.14	111	45,588	2.67	39,025	1.18
20	8/22-8/24	48	32	3	0.00	3	0.00	1,939	1.26	286	0.19	4,519	0.13	114	47,527	2.55	39,311	1.14
21	8/26-8/28	48	33	12	0.01	15	0.01	3,069	1.94	202	0.13	4,531	0.13	129	50,596	2.50	39,513	1.09
22	8/29-8/31	48	29	3	0.00	11	0.01	1,180	0.85	92	0.07	4,534	0.12	140	51,776	2.40	39,605	1.05
23	9/02-9/04	48	2	0	0.00	7	0.07	109	1.14	4	0.04	4,534	0.12	147	51,885	2.39	39,609	1.05
24	9/05-9/07	48	2	0	0.00	0	0.00	148	1.54	0	0.00	4,534	0.12	147	52,033	2.39	39,609	1.05

No pink salmon were sold.
Total hours fished = 1,008
Total number of permits used = 75
Cumulative coho boat hours began when 100 coho were caught.

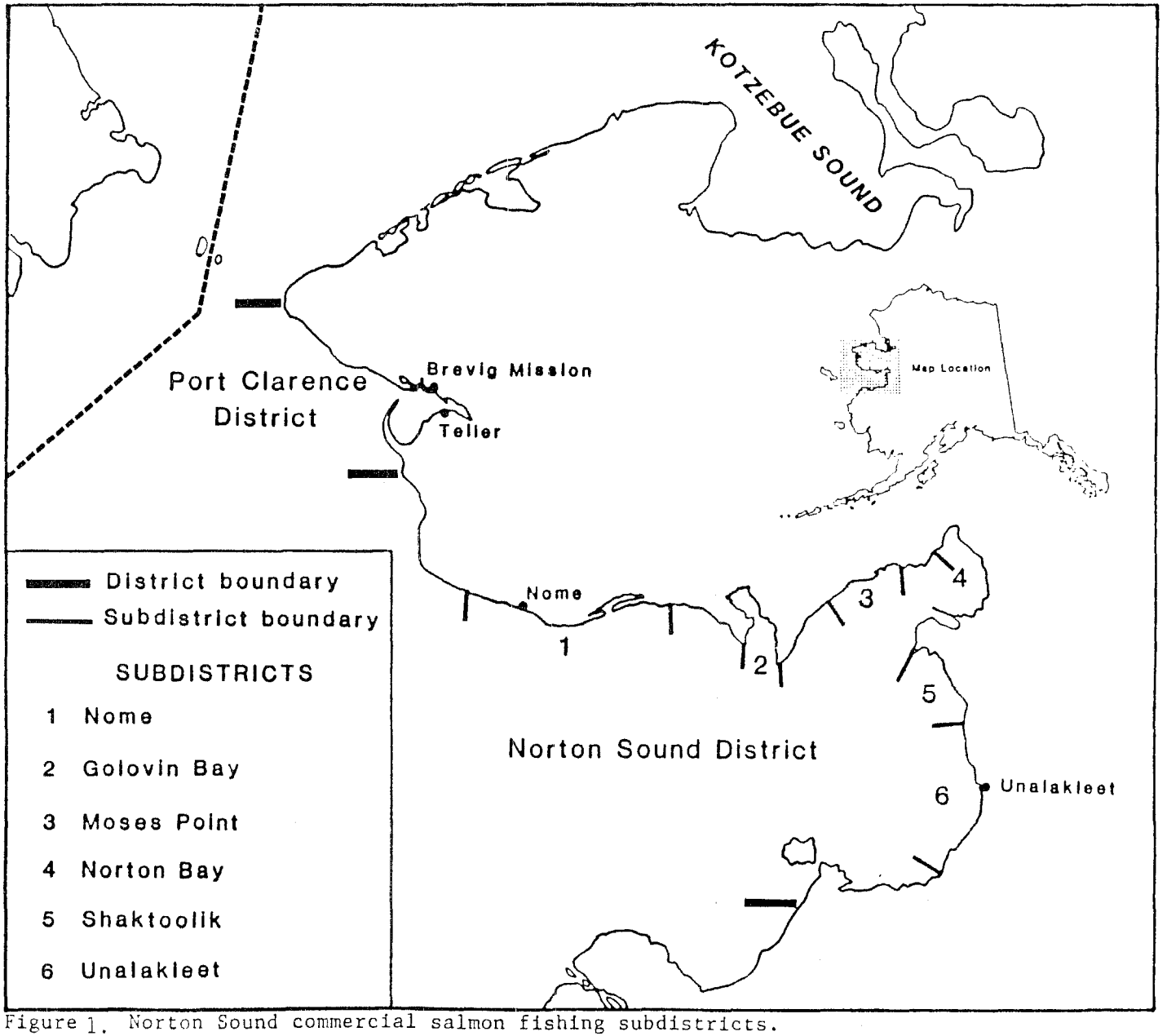


Figure 1. Norton Sound commercial salmon fishing subdistricts.

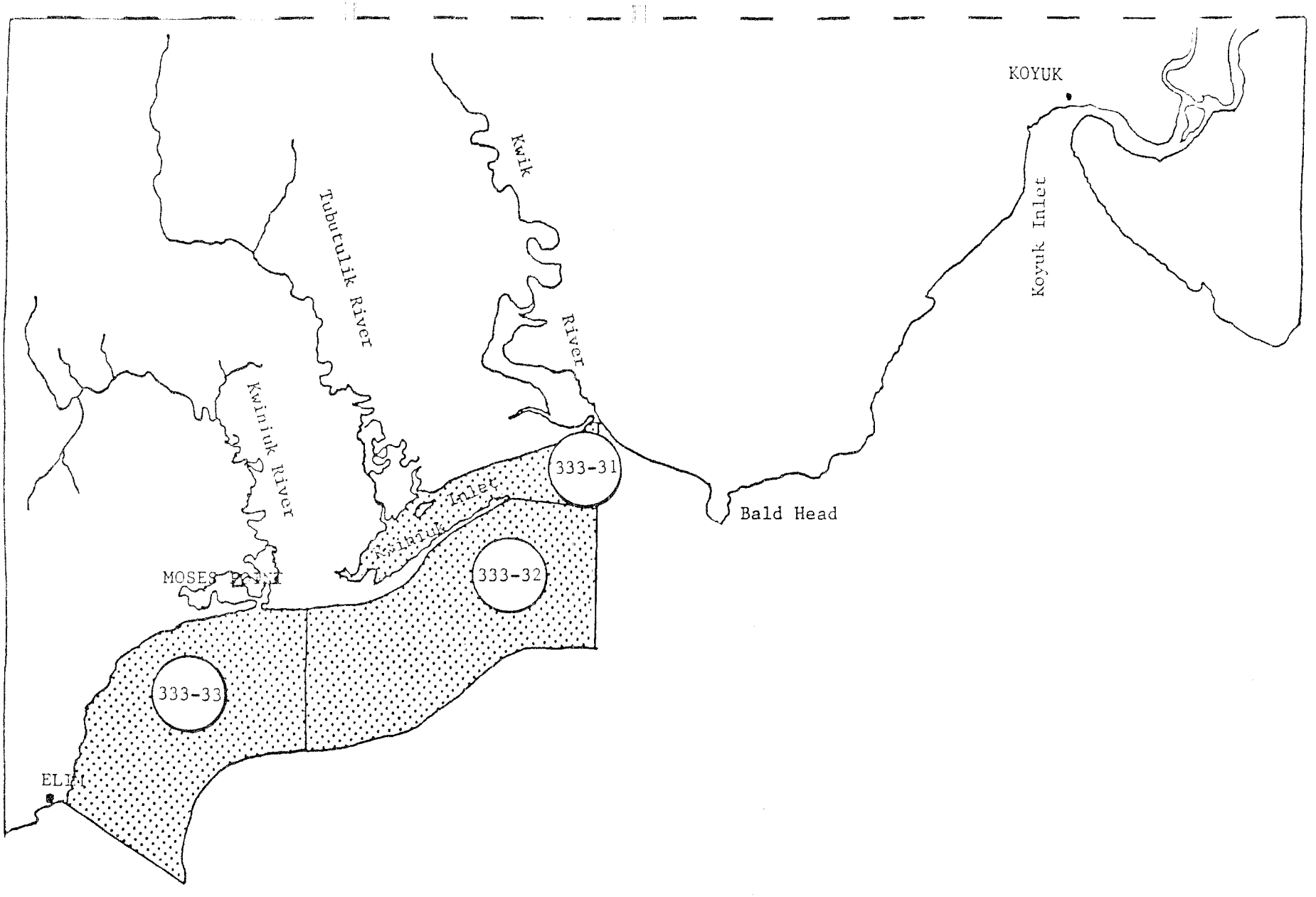


Figure 2. Statistical areas of the Moses Point commercial salmon fishing subdistrict, Norton Sound.

Appendix Table A1. Number of commercial salmon fishermen fishing in Norton Sound, 1970-1991.

Year	SUBDISTRICT 1	2	3	4	5	6	DISTRICT [a] Totals
1970	6	33	21	0	12	45	[b]
1971	7	22	45	6	19	72	[b]
1972	20	20	48	32	20	71	[b]
1973	21	34	57	30	27	94	[b]
1974	25	25	60	8	23	53	[b]
1975	24	42	67	42	39	61	[b]
1976	21	22	54	27	37	60	[b]
1977	14	25	52	24	30	45	164
1978	16	24	44	26	26	51	176
1979	15	21	41	22	29	63	175
1980	14	17	26	13	26	66	159
1981	15	19	33	10	26	73	167
1982	18	17	28	10	32	68	164
1983	19	21	39	15	34	72	170
1984	8	22	25	8	24	74	141
1985	9	21	34	12	21	64	155
1986	13	24	34	9	30	73	163
1987	10	21	34	12	39	65	164
1988	5	21	36	13	21	69	152
1989	2	0	13	0	26	73	110
1990	0	15	23	0	28	73	128
1991	0	16	24	0	25	75	126

[a] District total is the number of fishermen that actually fished in Norton Sound; some fishermen may have fished more than one subdistrict.

[b] Data not available.

Appendix Table A2. Commercial and subsistence salmon catches by species, by year in Nome Subdistrict, Norton Sound District, 1964-1991.

Year	Commercial						Subsistence					Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
NOME (SUBDISTRICT 1)																	
1964	5	-	-	1	1194	1200	-	-	-	-	-	5	-	-	1	1194	1200
1965	1	-	-	193	1941	2135	-	-	780	1825	2605	1	-	-	973	3766	4740
1966	1	-	32	1	581	615	12	192	1794	1762	3760	13	-	224	1795	2343	4375
1967	-	-	-	72	406	478	11	36	349	627	1023	11	-	36	421	1033	1501
1968	-	-	-	50	102	152	7	108	6507	621	7243	7	-	108	6557	723	7395
1969	-	-	63	330	601	994	2	27	3649	508	4186	2	-	90	3979	1109	5180
1970	-	-	6	55	960	1019	-	35	5001	458	5494	-	-	41	5056	1418	6513
1971	11	-	-	14	2315	2340	-	122	5457	2900	8479	11	-	122	5471	5215	10819
1972	15	-	-	12	2643	2670	19	52	4684	315	5070	34	-	52	4696	2958	7740
1973	-	-	-	321	1132	1453	14	120	5108	1863	7114	14	-	129	5429	2995	8567
1974	19	-	123	7722	10431	18295	8	5	3818	183	4014	27	-	128	11540	10614	22309
1975	2	-	319	2163	8364	10848	2	97	6267	2858	9224	4	-	416	8430	11222	20072
1976	2	10	26	1331	7620	8989	13	189	5492	1705	7399	15	10	215	6823	9325	16388
1977	8	-	58	65	15998	16129	35	498	2773	12192	15498	43	-	556	2838	28190	31627
1978	19	-	-	22869	8782	31670	35	225	13063	4295	17618	54	-	225	35932	13077	49288
1979	9	-	29	5860	5391	11289	11	1120	6353	3273	10757	20	-	1149	12213	8664	22046
1980	8	-	-	10007	13922	23937	129	2157	22246	5983	30515	137	-	2157	32253	19905	54452
1981	4	-	508	3202	18666	22380	35	1726	5584	8579	15938 [c]	39	14	2234	8786	27245	38318
1982	20	-	1183	18512	13447	33162	21	1829	19202	4831	25889 [d]	41	6	3012	37714	18278	59051
1983	23	-	261	308	11691	12283	74	1911	8086	7091	17215 [e]	97	53	2172	8394	18782	29498
1984	7	-	820	-	3744	4571	83	1795	17182	4883	23949 [f]	90	16	2615	17182	8627	28520
1985	21	-	356	-	6219	6596	56	1054	2117	5667	9008 [g]	77	114	1410	2117	11886	15604
1986	6	-	50	-	8160	8216	150	688	8720	8085	17750 [h]	156	107	738	8720	16245	25966
1987	3	-	577	-	5646	6226	200	1100	1251	8394	11052 [i]	203	107	1677	1251	14040	17278
1988	2	-	54	182	1628	1866	63	1076	2159	5952	9250 [j]	65	169	1130	2341	7580	11285
1989	2	-	-	123	492	619	24	469	924	3399	4816 [k]	26	127	469	1047	3891	5562
1990	0	-	0	0	0	0	58	510	2233	4246	7280 [l]	58	233	510	2233	4246	7280
1991	0	0	0	0	0	0	83	1279	194	3715	5652 [m]	45	56	1148	172	3348	4769
5-year avg. [a]	3	-	136	61	3185	3385	99	179	3057	6015	10030	102	149	905	3118	9200	13474
10-year avg. [b]	9	-	381	4465	6969	9592	76	1216	6746	6113	14215	85	95	1597	8979	13082	23836

[a] 1986-1990
[b] 1981-1990
[c] Total includes 14 sockeye
[d] Total includes 6 sockeye
[e] Total includes 53 sockeye.
[f] Total includes 16 sockeye.
[g] Total includes 114 sockeye.
[h] Total includes 107 sockeye.
[i] Total includes 107 sockeye.
[j] Total includes 133 sockeye.
[k] Total includes 131 sockeye.
[l] Total includes 234 sockeye.
[m] Total includes 166 sockeye

Appendix Table A3. Commercial and subsistence salmon catches by species, by year in Golovin Subdistrict, Norton Sound District, 1962-1991.

Year	Commercial						Subsistence					Combined					
	Chi-nook	Sock-eye	Coho	Pink	Chum	Total	Chi-nook	Coho	Pink	Chum	Total	Chi-nook	Sock-eye	Coho	Pink	Chum	Total
							GOLOVIN BAY (SUBDISTRICT 2)										
1962	45	11	264	10276	68720	79316	-	-	-	-	-	45	11	264	10276	68720	79316
1963	40	40	-	19677	49850	69607	-	118	5702	9319	15139	40	40	118	25379	59169	84746
1964	27	40	3	7236	58301	65607	-	-	-	-	-	27	40	3	7236	58301	65607
1965	-	-	-	-	-	-	2	49	1523	3847	5421	2	-	49	1523	3847	5421
1966	17	14	584	4665	29791	35071	4	176	1573	3520	5273	21	14	760	6238	33311	40344
1967	10	-	747	5790	31193	37740	3	185	2774	4803	7765	13	-	932	8564	35996	45505
1968	12	-	205	18428	10011	28656	4	181	4955	1744	6884	16	-	386	23383	11755	35540
1969	28	-	1224	23208	20949	45409	2	190	2760	2514	5466	30	-	1414	25968	23463	50875
1970	13	-	3	18721	20566	39303	4	353	2046	2614	6017	17	-	356	20767	23180	45320
1971	37	-	197	2735	33824	36793	7	191	1544	1936	3678	44	-	388	4279	35760	40471
1972	36	-	20	6562	27097	33715	4	62	1735	2028	3829	40	-	82	8297	29125	37644
1973	70	-	183	14145	41689	56087	1	48	9	74	132	71	-	231	14154	41763	56219
1974	30	-	3	28340	30173	58546	3	-	967	205	1175	33	-	3	29307	30379	58722
1975	17	-	206	10770	41761	52754	-	1	2011	2025	4037	17	-	207	12781	43786	56791
1976	12	-	1311	24051	30219	55593	-	-	1995	1128	3123	12	-	1311	26046	31347	58716
1977	26	-	426	7928	53912	62292	3	80	703	2915	3701	29	-	506	8631	56827	65993
1978	22	-	94	72033	41462	113611	1	-	2470	1061	3532	23	-	94	74503	42523	117143
1979	75	49	1606	45948	30201	77879	-	845	2546	2840	6231	75	49	2451	48494	33041	84110
1980	36	36	328	10774	52609	63783	12	692	10727	4057	15488	48	36	1020	21501	56666	79271
1981	23	5	13	49755	58323	108119	8	1520	5158	5543	12229	31	5	1533	54913	63866	120348
1982	78	5	4281	39510	51970	95844	7	1289	4752	1868	7916	85	5	5570	44264	53838	103760
1983	52	10	295	17414	48283	66054	-	-	-	-	- [c]	-	-	-	-	-	-
1984	31	-	2462	88588	54153	145234	-	-	-	-	- [c]	-	-	-	-	-	-
1985	193	113	1196	3019	55781	60302	12	430	1904	9577	11925 [d]	205	115	1626	4923	65358	72227
1986	81	8	958	25425	69725	96197	-	-	-	-	- [c]	-	-	-	-	-	-
1987	166	51	2203	1579	44334	48333	-	-	-	-	- [c]	-	-	-	-	-	-
1988	108	921	2149	31559	33348	68085	-	-	-	-	- [c]	-	-	-	-	-	-
1989	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1990	52	21	0	0	15993	16066	-	-	-	-	- [c]	-	-	-	-	-	-
1991	49	1	0	0	14839	14889	-	-	-	-	- [c]	-	-	-	-	-	-
5-Year avg. [a]	81	200	1062	11713	32680	45736	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	78	113	1356	25685	43191	70423	-	-	-	-	-	-	-	-	-	-	-

[a] 1986-1990

[c] Subsistence surveys not conducted.

Appendix Table A4. Commercial and subsistence salmon catches by species, by year in Moses Point Subdistrict, Norton Sound District, 1962-1991.

	Commercial						Subsistence					Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
							MOSES POINT (SUBDISTRICT 3)										
1962	27	-	-	11100	50683	61810	-	-	-	-	-	27	-	-	11100	50683	61810
1963	15	-	-	2549	46274	48838	5	-	5808	8316	14129	20	-	-	8357	54590	62967
1964	32	3	-	3372	28568	31975	-	-	63	348	411	32	3	-	3435	28916	32386
1965	-	-	-	-	-	-	16	72	1325	9857	11270	16	-	72	1325	9857	11270
1966	17	-	-	2745	24741	27503	14	250	2511	5409	8184	31	-	250	5256	30150	35687
1967	-	-	-	-	-	-	39	116	1322	9913	11390	39	-	116	1322	9913	11390
1968	12	-	1	9012	17908	26933	2	80	6135	2527	8744	14	-	81	15147	20435	35677
1969	29	-	-	11807	26594	38430	9	109	1790	1303	3211	38	-	109	13597	27897	41641
1970	39	-	-	13052	29726	42817	16	160	4661	6960	11797	55	-	160	17713	36686	54614
1971	95	-	4	922	43831	44852	16	271	1046	2227	3560	111	-	275	1968	46058	48412
1972	190	-	11	5866	30919	36986	44	108	1579	2070	3801	234	-	119	7445	32989	40787
1973	134	-	-	10603	31389	42126	2	-	-	298	300	136	-	-	10603	31687	42426
1974	198	-	9	12821	55276	68304	3	-	2382	1723	4108	201	-	9	15203	56999	72412
1975	16	-	-	4407	46699	51122	2	6	1280	508	1796	18	-	6	5687	47207	52918
1976	24	-	232	5072	10890	16218	22	-	5016	1548	6586	46	-	232	10088	12438	22804
1977	96	-	6	9443	47455	57000	22	225	1145	1170	2562	118	-	231	10588	48625	59562
1978	444	-	244	39694	44595	84977	38	407	1995	1229	3669	482	-	651	41689	45824	88646
1979	1035	-	177	40811	37123	79146	16	890	6078	1195	8179	1051	-	1067	46889	38318	87325
1980	502	-	-	1435	14755	16693	131	229	4232	1393	5985	633	-	230	5667	16148	22678
1981	198	-	5	26417	29325	55945	32	2345	6530	2819	11726	230	-	2350	32947	32144	67671
1982	253	-	318	9849	40030	50450	1	1835	3785	3537	9158	254	-	2153	13634	43567	59608
1983	254	-	-	17027	65776	83057	-	-	-	-	- [c]	-	-	-	-	-	-
1984	-	-	5959	28035	9477	43471	-	-	-	-	- [c]	-	-	-	-	-	-
1985	816	32	1803	559	24466	27676	67	1389	1212	947	3615	883	32	3192	1771	25413	31291
1986	600	41	5874	15795	20668	42978	-	-	-	-	- [c]	-	-	-	-	-	-
1987	907	15	64	568	17278	18832	-	-	-	-	- [c]	-	-	-	-	-	-
1988	663	93	3974	13703	18585	37018	-	-	-	-	- [c]	-	-	-	-	-	-
1989	62	-	-	-	1667	1729	-	-	-	-	- [c]	-	-	-	-	-	-
1990	202	-	-	501	3723	4426	-	-	-	-	- [c]	-	-	-	-	-	-
1991	161	0	0	0	804	965	-	-	-	-	- [c]	-	-	-	-	-	-
5-Year avg. [a]	487	30	1982	6113	12384	20997											
10-Year avg. [b]	396	18	1800	11245	23100	36558											

Appendix Table A5. Commercial and subsistence salmon catches by species, by year in Norton Bay Subdistrict, Norton Sound District, 1962-1991.

Year	Commercial						Subsistence					Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
							NORTON BAY (SUBDISTRICT 4)										
1962	387	7	40	4402	24380	29216	-	-	-	-	-	387	7	40	4402	24380	29216
1963	137	2	-	17676	12469	30284	-	-	5097	-	5097	137	2	-	22773	12469	35381
1964	50	3	-	988	5916	6957	-	-	-	-	-	50	3	-	988	5916	6957
1965	-	-	-	-	-	-	4	22	252	3032	3310	4	-	22	252	3032	3310
1966	-	-	-	-	-	-	7	41	929	3612	4589	7	-	41	929	3612	4589
1967	-	-	-	-	-	-	12	14	1097	2945	4068	12	-	14	1097	2945	4068
1968	-	-	-	-	-	-	28	71	1916	1872	3887	28	-	71	1916	1872	3887
1969	26	-	-	4849	3974	8849	59	189	2115	3855	6218	85	-	189	6964	7829	15067
1970	-	-	-	-	-	-	3	10	840	3500	4353	3	-	10	840	3500	4353
1971	-	-	-	-	-	-	5	47	92	2619	2763	5	-	47	92	2619	2763
1972	43	-	-	1713	7799	9555	30	44	2089	2022	4185	73	-	44	3802	9821	13740
1973	28	-	-	1645	4672	6345	1	-	10	130	141	29	-	-	1655	4802	6486
1974	21	-	-	654	3826	4501	-	-	17	900	917	21	-	-	671	4726	5418
1975	68	-	89	1137	17385	18679	1	-	93	361	455	69	-	89	1230	17746	19134
1976	102	-	95	4456	7161	11814	2	-	41	236	279	104	-	95	4497	7397	12093
1977	158	-	1	2495	13563	16217	14	-	420	2055	2489	172	-	1	2915	15618	18706
1978	470	-	144	8471	21973	31058	12	21	1210	1060	2303	482	-	165	9681	23033	33361
1979	856	-	2547	6201	15599	25203	12	697	735	1400	2844	868	-	3244	6936	16999	28047
1980	340	-	-	47	7855	8242	22	33	4275	1132	5462	362	-	719	5052	16158	22268
1981	63	-	-	177	3111	3351	7	82	2314	3515	5918	70	-	82	2491	6626	9269
1982	96	-	2332	2535	7128	12091	1	484	2600	2485	5570	97	-	2816	5135	9613	17661
1983	215	-	204	3935	17157	21511	-	-	-	-	- [c]	-	-	-	-	-	-
1984	-	-	-	1162	3442	4604	-	-	-	-	- [c]	-	-	-	-	-	-
1985	528	-	384	68	9948	10928	-	-	-	-	- [c]	-	-	-	-	-	-
1986	139	2	1512	40	1994	3687	-	-	-	-	- [c]	-	-	-	-	-	-
1987	544	-	145	16	3586	4291	-	-	-	-	- [c]	-	-	-	-	-	-
1988	434	2	709	1749	7521	10415	-	-	-	-	- [c]	-	-	-	-	-	-
1989[d]	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1990[d]	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1991[d]	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
5-Year avg. [a]	223	-	473	361	2620	3679	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	201	-	529	968	5389	7088	-	-	-	-	-	-	-	-	-	-	-

[a] 1986-1990
[b] 1981-1990
[c] Subsistence surveys not conducted.
[d] No commercial harvest reported.

Appendix Table A6. Commercial and subsistence salmon catches by species, by year in Shaktoolik Subdistrict, Norton Sound District, 1961-1991.

	Commercial						Subsistence					Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
							SHAKTOOLIK (SUBDISTRICT 5)										
1961	140	-	-	29075	24746	53961	-	-	-	-	-	140	-	-	29075	24746	53961
1962	1738	-	2113	640	8718	13209	-	-	-	-	-	1738	-	2113	640	8718	13209
1963	480	11	563	5138	19153	25345	-	-	-	-	-	480	11	563	5183	19153	25345
1964	631	79	16	1969	35272	37967	77	340	2132	5412	7961	708	79	356	4101	40684	45928
1965	127	30	-	3	8356	8516	31	107	3763	3420	7321	158	30	107	3766	11776	15837
1966	310	-	956	344	8292	9902	142	762	1445	4183	6532	452	-	1718	1789	12475	16434
1967	43	-	88	1050	1655	2836	262	387	2010	4436	7095	305	-	475	3060	6091	9931
1968	61	-	130	2205	2504	4900	10	458	6355	1915	8738	71	-	588	8560	4419	13638
1969	33	-	276	6197	8645	15151	40	193	4018	3439	7690	73	-	469	10215	12084	22841
1970	197	-	155	2301	15753	18406	43	210	2474	2016	4743	240	-	365	4775	17769	23149
1971	284	-	238	28	13399	14949	87	329	494	5060	5970	371	-	567	522	18459	20919
1972	419	-	11	2798	12022	15250	64	235	939	3399	4637	483	-	246	3737	15421	19887
1973	289	-	177	6450	14500	21416	51	130	3410	1397	4988	340	-	307	9860	15897	26404
1974	583	-	179	5650	26391	32803	93	353	1901	358	2705	676	-	532	7551	26749	35508
1975	651	2	812	1774	49536	51963	18	14	1394	334	1760	669	2	826	3108	49870	54535
1976	892	-	129	15803	15798	32622	24	121	1188	269	1602	916	-	250	16991	16067	34224
1977	1521	4	418	7743	36591	46277	49	170	585	2190	2994	1570	4	588	8328	38781	49271
1978	1339	7	1116	46236	35388	84086	81	15	3275	1170	4541	1420	7	1131	49511	36558	88627
1979	2377	-	3383	18944	22030	46734	62	1605	2575	1670	5912	2439	-	4988	21519	23700	52646
1980	1086	-	8001	1947	27453	38488	57	756	3227	1827	5867	1143	1	8757	5174	29280	44355
1981	1484	4	1191	29695	21097	53471	8	525	2225	3490	6248	1492	4	1716	31920	24587	59719
1982	1677	3	22233	17019	26240	67172	68	2138	3865	1165	7236	1745	3	24371	20884	27405	74408
1983	2742	4	12877	12031	67310	94964	-	-	-	-	-	- [c]	-	-	-	-	-
1984	1613	-	10730	1596	32309	46248	-	-	-	-	-	- [c]	-	-	-	-	-
1985	5312	-	2808	-	13403	21523	298	1379	24	298	1999	5610	-	4187	24	13701	23522
1986	1075	29	6626	-	16126	23856	-	-	-	-	-	- [c]	-	-	-	-	-
1987	2214	-	6193	-	14088	22495	-	-	-	-	-	- [c]	-	-	-	-	-
1988	671	79	6096	3681	21521	32048	-	-	-	-	-	- [c]	-	-	-	-	-
1989	1241	43	8066	-	19641	28991	-	-	-	-	-	- [c]	-	-	-	-	-
1990	2644	49	4695	-	21748	29136	-	-	-	-	-	- [c]	-	-	-	-	-
1991	1324	55	11614	-	31619	44612											
5-Year avg. [a]	1569	40	6335	736	18625	27305	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	2067	21	8152	6402	25348	41990	-	-	-	-	-	-	-	-	-	-	-

Appendix Table A7. Commercial and subsistence salmon catches by species, by year in Unalakleet Subdistrict, Norton Sound District, 1961-1991.

Year	Commercial Chinook	Commercial Sockeye	Commercial Coho	Commercial Pink	Commercial Chum	Commercial Total	Subsistence Chinook	Subsistence Coho	Subsistence Pink	Subsistence Chum	Subsistence Total	Combined Chinook	Combined Sockeye	Combined Coho	Combined Pink	Combined Chum	Combined Total
							UNALAKLEET (SUBDISTRICT 6)										
1961	5160	35	13807	5162	23586	47750	-	-	-	-	-	5160	35	13807	5162	23586	47750
1962	5089	-	6739	6769	30283	48880	-	-	-	-	-	5089	-	6739	6769	30283	48880
1963	5941	18	16202	11140	27003	60304	-	-	-	-	-	5941	18	16202	11140	27003	60304
1964	1273	1	79	1	19611	20965	488	2227	7030	6726	16471	1761	1	2306	7031	26337	37436
1965	1321	-	2030	24	26498	29873	521	4562	11488	8791	25362	1842	-	6592	11512	35289	55235
1966	1208	-	4183	5023	16840	27254	90	789	6083	3387	10349 [f]	1298	-	4972	11106	20227	37603
1967	1751	-	1544	21961	8502	33758	490	484	9964	-	10938	2241	-	2028	31925	8502	44696
1968	960	-	6549	41474	14865	63848	186	1493	11044	2982	15705	1146	-	8042	52518	17847	79553
1969	2276	-	5273	40558	22032	70139	324	1483	4230	4196	10233	2600	-	6756	44788	26228	80372
1970	1604	-	4261	30779	40029	76673	495	3907	10104	7214	21720	2099	-	8168	40883	47244	98393
1971	2166	-	2688	1196	37543	43593	911	3137	2230	7073	13351	3077	-	5825	3426	44616	56944
1972	2235	-	412	28231	20440	51318	643	1818	3132	4132	9725	2878	-	2230	31363	24572	61043
1973	1397	-	8922	13335	25716	49370	323	213	6233	3426	10195	1720	-	9135	19568	29142	59565
1974	2100	-	1778	93332	36170	133380	313	706	7341	588	8948	2413	-	2484	100673	36758	142328
1975	1638	-	3167	12137	48740	65682	163	74	4758	2038	7033	1801	-	3241	16895	50778	72715
1976	1211	1	5141	37203	24268	67824	142	694	4316	2832	7984	1353	1	5835	41519	27100	75808
1977	2691	1	2781	21001	32936	59410	723	1557	8870	6085	17235	3414	1	4338	29871	39021	76645
1978	7525	5	5737	136200	37079	186546	1044	2538	13268	3442	20292	8569	5	8275	149468	40521	206838
1979	6354	8	23696	49647	30445	110150	640	3330	6960	1597	12527	6994	8	27026	56607	32042	122677
1980	4339	3	21512	203142	64198	293194	1046	4758	19071	5230	30105	5385	3	26270	222213	69428	323299
1981	6157	47	29845	123233	39186	198468	869	5808	5750	4235	16686 [c]	7026	71	35650	128983	43421	215154
1982	3768	2	61343	142856	44520	252489	913	7037	20045	4694	32691 [d]	4681	4	68380	162901	49214	285090
1983	7022	13	36098	26198	109220	178551	1868	6888	13808	4401	26998 [e]	8890	46	42986	40006	113621	205549
1984	6804	6	47904	-	43317	98031	1650	6675	17418	3348	29092 [g]	8454	7	54579	17418	46665	127123
1985	12621	21	15421	1	25111	53175	1397	2244	55	1968	5667 [h]	14018	24	17665	56	27079	58842
1986	4494	153	20580	-	30239	55466	-	-	-	-	- [i]	-	-	-	-	-	-
1987	3246	141	15097	97	17525	36106	-	-	-	-	- [i]	-	-	-	-	-	-
1988	2218	157	24232	23730	25363	75700	-	-	-	-	- [i]	-	-	-	-	-	-
1989	4402	222	36025	-	20825	61474	-	4681	17500	1388	- [i]	-	-	-	-	-	-
1990	5998	358	52015	-	23659	82030	2476[j]	-	-	-	-	-	-	-	-	-	-
1991	4534	147	52033	-	39609	96323	-	-	-	-	-	-	-	-	-	-	-
5-Year avg. [a]	4072	206	29590	4765	23522	62155	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	5673	112	33856	31612	37897	109149	-	-	-	-	-	-	-	-	-	-	-

[a] 1986-1990
[b] 1981-1990
[c] Includes 24 sockeye salmon
[d] Includes 2 sockeye salmon
[e] Subsistence catches from 1966-72 includes fish taken at St. Michael
[g] Includes 1 sockeye salmon
[h] Includes 3 sockeye salmon
[i] Subsistence surveys not conducted

Appendix Table A8. Commercial and subsistence salmon catches by species, by year for all subdistricts in Norton Sound District, 1961-1991.

Year	Commercial						Subsistence					Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
							ALL SUBDISTRICTS										
1961	5300	35	13807	34327	48332	101801	-	-	-	-	-	5300	35	13807	34327	48332	101801
1962	7286	18	9156	33187	182784	232431	-	-	-	-	-	7286	18	9156	33187	182784	232431
1963	6613	71	16765	55625	154789	233863	5	118	16607	17635	34365	6618	71	16883	72232	172424	268228
1964	2018	126	98	13567	148862	164671	565	2567	9225	12486	24843	2583	126	2665	22792	161348	189514
1965	1449	30	2030	220	36795	40524	574	4812	19131	30772	55289	2023	30	6842	19351	67567	95813
1966	1553	14	5755	12778	80245	100345	269	2210	14335	21873	38687	1822	14	7965	27113	102118	139032
1967	1804	-	2379	28879	41756	74818	817	1222	17516	22724	42279	2621	-	3601	46395	64480	117097
1968	1045	-	6885	71179	45300	124409	237	2391	36912	11661	51201	1282	-	9276	108091	56961	175610
1969	2392	-	6836	86949	82795	178972	436	2191	18562	15615	36804	2828	-	9027	105511	98410	215776
1970	1853	-	4423	64908	107034	178218	561	4675	26127	22763	54126	2414	-	9098	91035	129797	232344
1971	2593	-	3127	4895	131362	141977	1026	4097	10863	21815 [a]	37801	3619	-	7224	15758	153177	179778
1972	2938	-	454	45182	100920	149494	804	2319	14158	13966 [b]	31247	3742	-	2773	59340	114886	180741
1973	1918	-	9282	46499	119098	176797	392	520	14770	7185	22867	2310	-	9802	61269	126283	199664
1974	2951	-	2092	148519	162267	315829	420	1064	16426	3958	21868	3371	-	3156	164945	166225	337697
1975	2393	2	4593	32388	212485	251861	186	192	15803	8124 [c]	24305	2579	2	4785	48191	220609	276166
1976	2243	11	6934	87919	95956	193060	203	1004	18048	7718	26973	2446	11	7938	105964	103674	220033
1977	4500	5	3690	48675	200455	257325	846	2530	14296	26607	44279	5346	5	6220	62971	227062	301604
1978	9819	12	7335	325503	189279	531948	1211	2981	35281	12257	51730	11030	12	10316	360784	201536	583678
1979	10706	57	31438	167411	140789	350401	747	8487	25247	11975	46456	11453	57	39925	192658	152764	396857
1980	6311	40	29842	227352	180792	444337	1397	8625	63778	19622	93422	7708	40	38467	291130	200414	537759
1981	7929	56	31562	232479	169708	441734	2021	13416	28741	32866	77082 [f,g]	9950	94	44978	261220	202574	518816
1982	5892	10	91690	230281	183335	511208	1011	14612	54249	18580	88460 [f,h]	6903	18	106302	284530	201915	599668
1983	10308	27	49735	76913	319437	456420	-	-	-	-	- [i]	-	-	-	-	-	-
1984	8455	6	67875	119381	146442	342159	-	-	-	-	- [i]	-	-	-	-	-	-
1985	19491	166	21968	3647	134928	180200	-	-	-	-	- [i]	-	-	-	-	-	-
1986	6395	233	35600	41260	146912	230400	-	-	-	-	- [i]	-	-	-	-	-	-
1987	7080	207	24279	2260	102457	136283	-	-	-	-	- [i]	-	-	-	-	-	-
1988	4096	1252	37214	74604	107966	225132	-	-	-	-	- [i]	-	-	-	-	-	-
1989	5707	265	44091	123	42625	92811	-	-	-	-	- [i]	-	-	-	-	-	-
1990	8895	434	56712	501	65123	131665	-	-	-	-	- [i]	-	-	-	-	-	-
1991	6068	203	63647	-	86871	156789	-	-	-	-	- [i]	-	-	-	-	-	-
5-Year avg.[d]	6435	478	39579	23750	93017	163259	-	-	-	-	-	-	-	-	-	-	-
10-Year avg.[e]	8425	266	46073	78145	141893	274802	-	-	-	-	-	-	-	-	-	-	-

[a] Includes 197 recorded sockeye salmon in all subdistricts
[b] Includes 93 recorded sockeye salmon in all subdistricts
[c] Includes 11 recorded sockeye salmon in all subdistricts
[d] 1986-1990
[e] 1981-1990
[f] These figures also include data from Stebbins and St. Michael.
[g] Includes 38 sockeye salmon.
[h] Includes 8 sockeye salmon.
[i] Subsistence surveys not conducted in all subdistricts.

Appendix Table A9. Mean salmon weights, Norton Sound District, 1962-1991.[a]

Year	Mean Round Weight in Pounds[b] Chinook	Coho	Pink	Chum
1962	-	-	-	-
1963	-	-	-	-
1964	-	-	-	7.0
1965	-	-	2.3	7.1
1966	-	-	3.5	7.8
1967	23.7	7.0	3.6	7.2
1968	20.0	7.0	4.0	7.5
1969	19.3	7.5	3.6	6.4
1970	20.0	7.0	3.5	7.8
1971	23.7	7.0	3.6	7.2
1972	20.0	7.3	2.8	6.9
1973	20.3	6.8	3.9	7.1
1974	18.2	6.7	3.4	6.6
1975	10.8	7.4	2.9	6.5
1976	15.2	7.2	3.1	7.0
1977	22.7	7.6	3.3	7.0
1978	22.8	6.9	3.6	7.4
1979	22.9	7.1	3.6	7.2
1980	21.5	6.8	3.2	7.2
1981	20.7	6.7	3.5	7.6
1982	16.5	7.1	2.9	7.3
1983	17.4	7.2	3.6	7.4
1984	20.0	7.7	2.9	7.0
1985	21.5	7.7	3.1	7.0
1986	20.8	6.9	3.2	6.9
1987	20.0	7.3	3.0	7.1
1988	16.4	7.5	3.0	7.1
1989	18.4	7.6	3.6	7.0
1990	19.0	7.5	-	7.4
1991	17.7	7.4	-	6.9

[a] Information not available for some species.

[b] Based on age-weight-length samples or fish tickets.

Appendix Table A10. Estimated mean prices paid to commercial salmon fishermen, Norton Sound District, 1962-1991.[a]

Year	Chinook	Coho	Pink	Chum
		Price Per Fish		
1962	$3.85	$ .60	$ .25	$ .35
1963	3.85	.60	.25	.35
1964	4.50	--	.25	.40
1965	3.75	.45	--	.40
1966	4.80	1.05	.25	.65
		Price Per Pound		
1967	.20	.14	.07	.09
1968	.25	.14	.06	.10
1969	.22	.14	.06	.11
1970	.25	.14	.06	.10
1971	.25	.14	.07	.10
1972	.27	.16	.06	.11
1973	.40	.16	.07	.32
1974	.40	.16	.13	.32
1975	.40	.16	.13	.24
1976	.50	.32	.17	.30
1977	.65	.40	.16	.30
1978	.65	.35	.20	.30
1979	.88	.66	.16	.41
1980	.74	.63	.07	.23
1981	$1.25	.62	.13	.26
1982	$1.25	.57	.12	.32
1983	$1.13	.39	.11	.28
1984	$1.20	.45	.11	.24
1985	$1.08	.48	.20	.31
1986	.88	.52	.15	.27
1987	$1.11	.57	.20	.33
1988	$1.26	$1.13	.19	.39
1989	.73	.43	.10	.18
1990	$1.01	.50	.75[b]	.23
1991[c]	.87	.36	-	.27

[a] Information is not available for some species.

[b] Price paid per pound of roe.

[c] Price paid for coho and chum roe was $3.00 per pound.

Appendix Table A11. Dollar estimates of Norton Sound District commercial salmon fishery, 1961-1991.

Year	Gross Value of Catch to Fishermen	Wages Earned[b]	License and Tax Revenues to State (License Fees Only)
1961	$ [a]	$ [a]	$ 2,010.00
1962	105,800.00	[a]	16,341.00
1963	104,000.00	[a]	18,009.00
1964	51,000.00	[a]	11,305.00
1965	21,483.00	[a]	5,084.00
1966	68,000.00	[a]	4,680.00
1967	44,038.00	58,000.00	3,500.00
1968	63,700.00	[a]	4,000.00
1969	95,297.00	72,145.00	[a]
1970	99,019.00	55,100.00	5,595.00
1971	101,000.00	65,500.00	5,730.00
1972	102,225.00	68,700.00	7,000.00
1973	308,740.00	81,000.00	15,400.00
1974	437,127.00	129,600.00	20,028.00
1975	413,255.00	172,800.00	28,230.00
1976	285,283.00	[a]	10,133.00
1977	528,610.00	[a]	11,386.00
1978	814,221.00	[a]	12,002.00
1979	876,547.00	[a]	11,780.00
1980	583,388.00	[a]	11,640.00[c]
1981	758,471.00	[a]	11,940.00
1982	988,588.00	[a]	7,155.00[c] [d]
1983	1,038,967.00	[a]	10,700.00[c]
1984	721,055.00	[a]	9,690.00[c]
1985	822,056.00	[a]	5,820.00[e]
1986	539,576.00	[a]	5,970.00[e]
1987	504,631.00	[a]	5,940.00[e]
1988	754,751.00	[a]	10,050.00[e] [f]
1989	335,928.00	[a]	10,300.00[e] [f]
1990	497,623.00	[a]	10,350.00[e] [f]
1991	425,430.00	[a]	10,250.00[e] [f]

[a] Information not available.
[b] Includes wages paid to tender boat operators, processing plant employees in district.
[c] Includes only permit renewals and vessel license fees.
[d] The Alaska state legislature lowered all resident permit renewal fees and vessel license fees to poverty level fees for 1982.
[e] Includes only permit renewal fees.
[f] The Alaska state legislature raised resident permit renewal fee to $50.00 in 1988.

Appendix Table A12. Round weight of commercially caught salmon by species, Norton Sound District, 1961-1991.

Year	Pounds Caught (Round Wt. in Lbs) Chinook	Coho	Pink	Chum	Salmon Roe (lbs)
1961	120,405	96,649	102,711	347,990	
1962[a]	157,000	--	10,569	221,645	
1963[a]	89,700	51,750	--	--	
1964[a]	39,169	686	--	249,890	
1965	33,327	14,210	660	264,924	[b]
1966	35,259	40,285	38,334	577,764	16,901
1967	41,854	15,944	100,913	289,473	21,429
1968[c]	22,954	50,665	250,044	306,871	20,381
1969[d]	51,441	50,461	312,836	529,235	5,578
1970	38,103	25,000	156,313	610,588	1,345
1971	43,112	22,078	15,377	857,014	1,122
1972	57,675	3,257	133,389	710,853	1,083
1973	38,935	63,812	185,799	845,596	[b]
1974	54,433	15,023	511,737	1,082,575	39,876
1975	25,964	32,345	87,586	1,318,111	46,470
1976	34,095	49,822	271,867	669,728	[b]
1977	102,341	28,254	162,457	1,415,981	[b]
1978	222,974	50,872	1,164,174	1,389,806	[b]
1979	231,988	251,129	598,785	1,001,548	[b]
1980	135,646	204,498	719,368	1,301,693	[b]
1981	164,182	212,065	719,102	1,284,193	[b]
1982	97,255	648,212	659,171	1,338,788	95
1983	179,666	360,264	274,568	2,352,104	239
1984	169,104	523,310	343,685	1,020,635	0
1985	419,331	169,413	11,458	939,885	0
1986	133,161	247,333	133,319	1,011,824	0
1987	141,494	177,569	6,691	731,597	0
1988	67,148	280,658	226,966	767,168	0
1989	104,829	336,652	439	297,156	0
1990	168,745	426,902	--	482,060	75
1991	107,541	469,495	--	597,272	221

[a] Does not include canned salmon cases (48#)
1962: 29 chinook, 883 coho, 927 pink, 12,459 chum
1963: 604 chinook, 808 coho, 1,918 pink, 13,308 chum
1964: 75 chinook, 452 pink, 9,357 chum

[b] Information not available

[c] Includes about 48,000 lbs of salted coho, about 150,000 lbs. of salted pink, and 150,000 lbs of salted chum.

[d] Includes about 598 lbs. of salted chinook, about 48,092 lbs. of salted pink and about 117,664 lbs. salted chum.

Appendix Table A13. Comparative salmon escapement estimates of Norton Sound streams, 1961-1991.[a]

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			Sinuk River		
1975	--	4,662	5,390	--	--
1977	--	5,207	1,302	--	--
1978	--	8,756	22,435	--	--
1980	3	2,022	199,000	--	1,002
1981	--	5,579	350	--	--
1982	--	638	148,800	--	--
1983	48	2,150	10,770	--	96
1984	7[h]	493[h]	284,400[h]	--	192
1985	4	1,910	8,860	--	33
1986	4	1,960	28,690	--	--
1987	5	4,540	30	--	230
1988	3	2,070	4,652[i]	--	563
1989	--	1,025	26,850	--	75
1990	--	95	29,040	--	161
1991	3	5,420	14,680	--	701
			Nome River		
1971	--	75	7,765	--	--
1972	--	710	14,960	--	--
1973	6	1,760	14,940	--	--
1974	--	854	17,832	--	--
1975	1	2,161	3,405	--	--
1977	5	3,046	1,726	--	--
1978	2	5,242	34,900	--	--
1980	5	--	--	179,095	920
1981	15	1,195	12,565	--	--
1982	--	700	327,570	--	--
1983	2	198	9,170	--	365
1984	--	2,084[h]	178,870	--	839
1985	7	1,967	2,250	--	242
1986	2	1,150	13,580	--	--
1987	3	1,646	1,400[h]	--	419
1988	3	973	2,490[i]	--	1,280[h]
1989	2	72	1,365	--	375
1990	--	541	13,085	--	617
1991	9	3,520	4,690	--	611
			Flambeau River		
1976	--	375	1,994	--	--
1977	--	1,275	10	--	--
1978	--	7,110	--	--	--
1979	--	283	291	--	--
1980	--	--	--	29,190	--
1981	1	12,031	2,710	--	--
1982	1	5,097	25,001	--	--
1983	2	1,195	200	--	--
1984	1	3,150[g]	20,200[g]	--	--
1985	1	3,215	260	--	--
1986	2	3,075	300	--	--
1987	0	115	0	--	--
1988	3	765	10	--	--
1989	--	--	--	--	--
1990	--	--	--	--	--
1991	2	1,564	570	--	--

-Continued-

Appendix Table A13. (page 2 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[a]	Coho
			Eldorado River		
1974	13	2,143	6,185	--	--
1977	--	1,835	125	--	--
1978	--	10,125	12,800	--	--
1980	6	9,900	55,520	--	--
1981	--	15,605	495	--	--
1982	2	1,095	163,300	--	--
1983	11	994	270	--	100
1984	14[i]	4,361[g,i]	1,924,935[g,i]	--	261
1985	8	6,090	150	--	67
1986	9	3,490	18,200	--	--
1987	6	3,860	0	--	108
1988	17	2,645	1,045	--	78
1989	--	350	1,550	--	87
1990	17	884	2,050	--	44
1991	76	5,755	1,590	--	98
			Fish River		
1961	1	--	--	14,100	--
1962	48	--	--	28,918	--
1963	21	--	--	25,728	--
1964	--	18,670	10,935	14,550	--
1966	7	--	--	17,955	--
1967	20	--	--	13,610	--
1968	10	--	--	164,000	--
1969	--	2,080	124,000	--	--
1970	33	76,550	198,000	--	--
1971	1	13,185	1,670	--	--
1972[h]	--	3,616	13,050	--	--
1973	31	6,887	15,564	--	--
1974	7	10,945	15,690	--	--
1975	26	20,114	15,840	--	--
1976	1	8,390	15,850	8,550	--
1977	9	9,664	2,430	--	--
1978	29	26,797	140,640	--	--
1979	11	6,893	9,132	--	--
1980	--	19,100	33,500	--	--
1981	90	24,095	450	--	--
1982	--	--	--	241,700	--
1983	87	20,037	300	--	--
1984	42	--	--	293,245	--
1985	303	21,080	7,365	--	--
1986	200	25,190	140	--	--
1987	193	7,886	0	--	--
1988	36	1,240	29,950[i]	--	--
1989					
1990					
1991	58	10,190	51,190	--	--
			Kachavik Creek		
1963	--	16,000	16,000	--	--
1964	--	5,284	3,675	--	--
1966	--	758	1,788	--	--
1967[i]	--	--	--	1,780	--
1969	--	600	4,525	--	--
1970	--	500	--	--	--
1971	--	1,000	5,323	--	--
1972	--	3,100	16,950	--	--
1973	--	10,325	22,275	--	--
1974	--	1,645	2,723	--	--
1975	--	1,735	23,360	--	--
1977[i]	--	9,564	30,432	--	--
1978[h]	--	3,481	26,533	--	--
1979	--	2,650	23,850	--	--
1982	--	1,111	72,235	--	--
1988	--	1,440	3,130	--	--

-Continued-

Appendix Table A13. (Page 3 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
		Boston Creek			
1963	67	1,669	--	--	--
1964	10	3,315	--	--	--
1966[c]	153	761	--	--	--
1968	7	2,500	2,500	--	--
1969	100	7,000	16,000	--	--
1970	246	8,200	12,900	--	--
1971	42	7,045	80	--	--
1972	57	4,252	3,950	--	--
1973	153	3,014	3,213	--	--
1974	231	2,426	749	--	--
1975	147	1,885	2,556	--	--
1977	76	1,325	385	--	--
1978	136	2,655	74,221	--	--
1979	58	882	271	--	--
1980	16	2,450	1,510	--	--
1982	10	1,730	22,020	--	--
1983	154	704	--	--	--
1984	35	--	--	47,850	--
1985	243	3,450	--	--	--
1986	2	220	0	--	--
1987	583	3,640	0	--	--
1988	163	1,040	7,400[i]	--	--
1989	--	--	--	--	--
1990	--	1,455	8,440	--	--
1991	152	2,550	3,210	--	--
		Niukluk River			
1962	11	--	--	27,879	--
1963	1	13,687	4,103	--	--
1964	--	8,395	10,495	--	--
1966	--	21,300	8,600	4,700	--
1967	--	20,546	--	--	--
1968	--	--	--	87,085	--
1969	--	10,240	92,650	--	--
1970	--	7,300	60,350	--	--
1971	--	22,605	8,370	--	--
1972[c]	--	10,500	22,600	--	--
1973	--	14,365	14,790	--	--
1974	1	8,720	8,915	--	--
1975	--	10,089	16,258	--	--
1976	--	4,130	7,190	--	--
1977	19	10,456	4,150	--	--
1978	2	14,365	208,300	--	--
1979[d]	8	10,127	30,147	--	--
1980	--	8,915	75,770	--	--
1981	--	7,249	--	--	--
1982	20	2,557	227,540	--	--
1983	54	8,886	50	--	--
1984[j]	6	--	--	57,208	3,072
1985	25	11,140	--	--	332[k]
1986	2	2,442	0	--	--
1987	10	4,145	0	--	257[k]
1988	18	6,501	8,160[i]		1,095[k]
1989	--	--	--	--	182
1990	--	6,200	--	--	170
1991	24	10,660	37,410	--	1,783

-Continued-

Appendix Table A13. (page 4 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			Kwiniuk River		
1962	3	--	--	23,249	--
1963	2	11,340	3,779	--	--
1964	--	14,533	--	--	--
1965[d]	14	26,634	8,301	--	--
1966[d]	7	32,786	10,629	--	--
1967[d]	13	24,444	3,508	--	--
1968[d]	27	18,813	126,764	--	--
1969[d]	12	19,687	56,683	--	--
1970[d]	--	68,004	235,131	--	--
1971[d]	37	39,046	16,742	--	--
1972[d]	65	30,686	62,461	--	--
1973[d]	57	28,617	38,420	--	--
1974[d]	62	35,899	40,816	--	--
1975[d]	44	14,344	57,317	--	--
1976[d]	12	6,977	29,471	--	--
1977[d]	84	22,757	46,234	--	--
1978[c,d]	74	14,408	72,270	--	--
1979[d]	107	12,355	167,492	--	--
1980[d]	177	19,374	320,389	--	--
1981[d]	136	34,561	566,417	--	--
1982[d]	138	44,036	469,674	--	--
1983[d]	267	56,907	251,965	--	--
1984[d]	736	54,043	736,544	--	983[f]
1985[d]	712	9,912	22,548	--	673[f]
1986[d]	653	24,704	241,446	--	421
1987[d]	314	16,134	5,567	--	819[f]
1988[d]	321	13,301	187,904	--	444[f]
1989[d]	282	13,689	30,275	--	--[e]
1990[d]	744	13,735	404,452	--	746[e]
1991[d]	587	18,802	54,591	--	809[e]
			Tubutulik River		
1962	3	--	--	16,690	--
1963	9	16,069	4,355	--	--
1964	--	15,469	10,043	3,420	--
1966	--	5,514	26,000	--	--
1967	1	--	--	22,475	--
1969	3	12,040	12,788	3,045	--
1970	--	53,290	136,590	--	--
1971	--	16,820	7,500	5,065	--
1972[f]	--	8,070	21,100	--	--
1973	131	5,383	15,665	--	--
1974	136	9,560	17,940	--	--
1975	7	17,141	38,003	--	--
1976	--	1,095	6,095	2,600	--
1977	--	8,540	4,685	--	--
1978	2	5,865	1,364	--	--
1979	--	812	1,624	--	--
1980[d]	405	21,616	663,937	--	--
1982[f]	49	2,044	53,605	--	--
1983	135	16,345	40,790	--	--
1984	139	56,210	93,600	--	--
1985	472	13,645	8,940	--	--
1986	453	5,975	35,680	--	--
1987	474	9,605	580	--	--
1988	561	4,660	114,150[f]	--	--
1989[f]	--	--	--	--	--
1990	397	4,350	186,400	--	--
1991	661	7,085	26,870	--	--

-Continued-

Appendix Table A13. (Page 5 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			North River		
1962	162	--	--	16,087	--
1963[k]	287	--	--	73,274	--
1964	23	--	--	5,981	--
1965	153	--	--	16,600	--
1970[c]	1	20,655	12,400	--	--
1971[c]	256	--	--	1,047	--
1972[d]	561	2,332	54,934	--	--
1973[d]	298	4,332	26,542	--	--
1974[d]	220	861	154,285	--	--
1975[c]	60	5,237	17,885	--	--
1976[c]	66	196	10,606	--	--
1977	1,275	8,139	4,565	--	--
1978	321	9,349	21,813	--	--
1979	735	1,130	9,500	--	--
1980	61	2,300	127,900	--	204
1981	68	405	575	--	263
1982	8	599	173,352	--	4,145
1983	347	4,135	4,980	--	--
1984[d]	2,844	2,915	458,387	--	152[l]
1985[d]	1,426	4,567	4,360	--	2,045
1986[d]	1,613	3,738	236,487	--	--
1987	445	392	0	--	680
1988	202	30	112,770[l]	--	240
1989[c]	--	--	--	--	--
1990	255	510	25,685	--	--
1991	656	2,435	118,720	--	2,510

[a] Represents "high count" for season.
[b] Surveyor unable to distinguish between the two species.
[c] Poor survey conditions or partial survey, poor counting tower conditions.
[d] Total counts obtained from counting tower.
[e] Combined tower and aerial survey counts below the tower.
[f] Aerial survey; not tower count.
[g] Helicopter survey.
[h] Boat survey.
[i] Foot survey.
[j] Includes counts from Casadepaga and Ophir Creeks.
[k] Includes counts from Ophir Creek.
[l] Numerous pink salmon made enumerating of chum salmon difficult; pink count may include some chum.

PORT CLARENCE DISTRICT

District Boundaries

The Port Clarence district encompasses all waters from Cape Douglas north to Cape Prince of Wales including the Salmon Lake and Pilgrim River drainage (Figure 3). Salmon, saffron cod, whitefish and herring are the major subsistence species; however, other fishery resources are also utilized.

Commercial Fishery

Commercial salmon fishing in this district has been prohibited since 1967. In 1966 a total of 1,216 salmon consisting of 93 sockeye, 131 pinks and 922 chums was taken commercially in the Grantley Harbor/Tuksuk Channel area. A few salmon are sold or bartered each year in Teller and Nome. Due to the relatively small runs in this area and the existence of an important subsistence fishery, commercial salmon fishing has not been reopened.

Subsistence Fishery

A traditional subsistence salmon fishery has probably occurred within this district for centuries; however, subsistence fishing has only been reported of monitored at Salmon Lake since the 1930's and upper Pilgrim River since 1962. Data collected by Department personnel has indicated a majority of the fishermen of Brevig Mission fish the northern and northeastern sections of Port Clarence, while Teller fishermen utilize Grantley Harbor and Tuksuk Channel. Interviews with local residents have also indicated substantial fishing effort within the Agiapuk River. Village surveys have not been conducted by Commercial Fisheries Division since 1983. Subsistence Division conducted a partial survey of Brevig Mission in 1989 where 15 of 43 households were interviewed (Appendix Table B1). Personal interviews with fishermen seem to indicate a decline in subsistence fishing effort, due primarily to the absence of younger fishermen entering the fishery. A majority of the subsistence fishing effort appears to be conducted by elder residents who gather fish for an entire family.

Salmon Lake and Pilgrim River stocks have been utilized primarily by Nome residents. The Alaska Board of Fisheries adopted a regulation in 1972 which closed Salmon Lake and it's tributaries to subsistence salmon fishing from July 15 through August 31 to conserve declining sockeye salmon stocks. Subsistence fishing permits are required for the Pilgrim and Kuzitrin Rivers. During the 1991 season, a dramatic increase in the number of subsistence permits issued to Nome residents intending to fish in the area was observed (Table 2C). This was due in part due to a strong sockeye salmon return. Another reason was the extensive subsistence fishing closures in the Nome area which made the Pilgrim River an alternative location to obtain their subsistence needs.

Escapement

Aerial surveys were not flown in this district, with the exception of Salmon Lake, due to the low priority assigned to districts which do not support commercial fisheries. Aerial surveys show an increasing trend of sockeye returns to Salmon Lake since 1986 (Appendix Table B2). In 1991, a total of count 5,360 sockeye to the system represents the highest escapement documented since the surveys began in 1963.

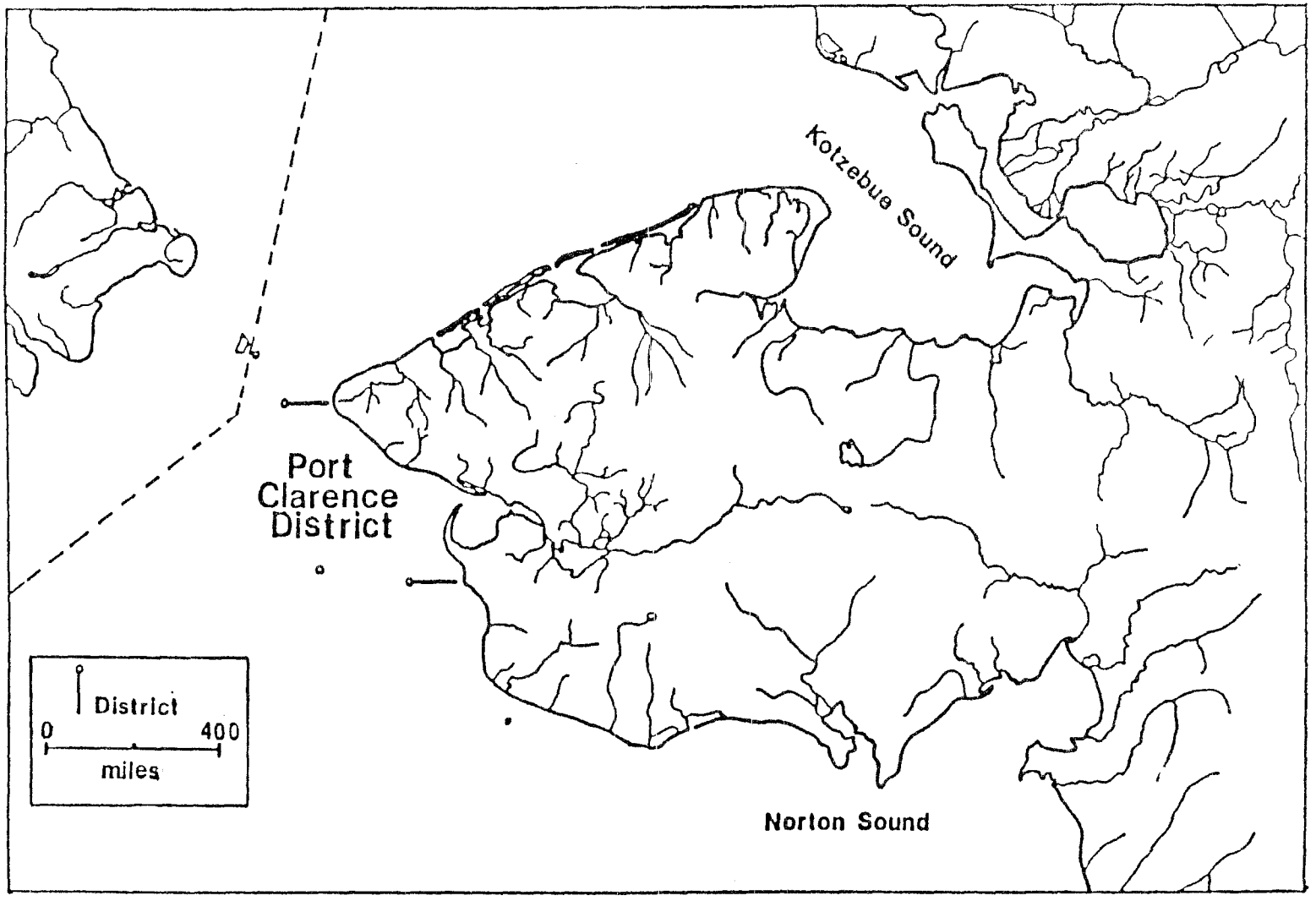


Figure 3. Port Clarence District

Appendix Table B1. Subsistence salmon catches for Port Clarence District, 1963-1991.

Year	Number of Fishing Families Interviewed	Chinook	Sockeye	Coho	Pink	Chum	Total
1963	19	9	4866	25	1061	1279	7440
1964	22	17	1475	227	371	1049	3139
1965	29	36	1804	639	1854	1602	5935
1966	26	10	1000	896	859	2875	5640
1967	19	12	2068	232	767	1073	4152
1968	24	40	688	133	1906	904	3671
1969	13	2	180	27	548	932	1582
1970	18	4	588	1071	1308	4231	7202
1971	22	31	850	959	1171	3769	6780
1972	8	4	68	388	75	2806	3341
1973	4	22	46	280	424	1562	2334
1974	13	0	28	62	14	2663	2767
1975	17	0	244	5	743	1589	2581
1976	15	7	291	20	436	6026	6780
1977 1/	13	-	-	-	-	-	5910
1978	26	1	392	0	7783	705	8881
1979	26	0	320	35	741	1658	2720
1980	22	7	3195	5	3170	1715	8092
1981	10	8	255	110	765	5845	6983
1982	27	23	405	100	4345	684	5557
1983 2/	3	17	261	--	615	299	1192
1984 3/							
1985 3/							
1986 3/							
1987 3/							
1988 3/							
1989 4/	15	28	535	472	395	410	1840
1990 3/							
1991 3/							

1/ Species composition estimated at 75% chum, 10% pink, 10% sockeye and 5% chinook and coho combined.

2/ Data collected from returned catch calendars. Due to low return of calendars and absence of household surveys, the resultant catches are incomplete and not comparable to past years.

3/ Surveys not conducted.

4/ Survey conducted by Subsistence Division and contacted 15 of 43 households in Brevig Mission.

Appendix Table B2. Comparative sockeye salmon aerial survey estimates, Port Clarence District, 1963-1991.

Year	Salmon Lake	Grand Central River	Total
1963	866	620	1486
1964 3/	76	590	666
1965	250	160	410
1966	1120	370	1490
1967	129	280	409
1968 3/	830	645	1475
1969	24	171	195
1970 1/	-	-	-
1971	538	512	1050
1972 3/	680	300 2/	980
1973	1747	607	2354
1974	820	0	820
1975	537	123	660
1976	132	22	154
1977	317	235	552
1978	822	280	1102
1979	1250	261	1511
1980 3/	512	175	687
1983	970	-	970
1984	445	30	475
1985	730	250	980
1986	2,125	160	2,285
1987	4,040	530	4,570
1988	1,195	6	1,201
1989	3,055	525	3,591
1990	2,834	926	3,760
1991	3,790	1,570	5,360

1/ No survey made.

2/ Boat survey.

3/ Poor survey.

KOTZEBUE SOUND

General Information

The Kotzebue District supports the northernmost commercial salmon fishery in Alaska (Figure 4). The recent commercial fishery opened under state management in 1962. Salmon harvests consist primarily of chum salmon, although a few Dolly Varden are incidentally harvested in mid-August. There are 224 commercial permit holders, of which an average of 176 were active over the recent ten year period. Ninety-seven percent are residents of the district.

The commercial fishery became fully developed during the mid-1970's. Since that time, the fishery has displayed a cyclic pattern of harvest that alternates between strong and weak returns over four year intervals and is generally declining (Appendix Table C1 and Figure 6). In 1987, the Department began a rebuilding program with an emphasis on attaining escapement goals. Prior to 1987, commercial harvest were more in proportion to the annual chum return. Current fisheries management is based on comparative age composition and catch rate in the commercial fishery relative to the historic average fishery performance by date.

Gear is limited to set nets with an aggregate of no more than 150 fathoms per fisherman. Most fishermen operate with one end on or near shore and with all three shackles (50 fathoms per shackle) connected. A few fishermen attempt to fish deeper channels in the mud flats farther off shore. Most gear used in the district is 5-7/8 in (14.9 cm) stretch multi-filament gill net.

In-Season Management

The primary fishery management objectives are to provide adequate chum salmon escapement through the district to ensure sustained runs by allowing adequate natural escapement, and meeting subsistence harvest needs. Fishery management is dependent on comparing period and cumulative in-season catch rates to prior years. The comparative data base was limited to the period 1979 to present in order to account for increased fleet efficiency and to encompass the range of years when similar fishing schedules were in effect.

Weekly meetings throughout the season are held with fishermen to distribute catch statistics and gain input from local fishermen for management decisions. Because there is no Department operated escapement index on the Kobuk River, subsistence fishermen that can be contacted by phone are called several times during the season to get an idea of run strength. Alaska Department of Fish and Game personnel also contact Kobuk Delta subsistence fishermen to gain further knowledge of the run strength and timing.

1989 Commercial Season Summary

One hundred and sixty-five permit holders fished at least one fishing period during the 1989 commercial salmon season which extended from July 10 to August

30. Harvest totals were 24 percent below the recent ten-year average (1979-1988) of 333,920 chum salmon (Table 9A).

After the first three periods of near average catches, both catch and catch rates dropped significantly below the recent ten-year average. Therefore, 24-hour periods remained in effect until July 31. However, on July 25 the period closure was delayed for four hours due to sudden unexpected violent weather conditions. This one-time extension was made because a large portion of the fishing fleet could not retrieve their nets by the end of the period, and the marine forecast predicted the winds to subside within a short time period.

Fishing time was extended to 36 hours on July 31 as has occurred by this date for the last ten years. Since catch and catch rates remained considerably below average, fishing time was reduced to 24 hours on August 3, to allow for adequate escapement and salmon for subsistence use. An increase in the catch rate and the number of 4 year old fish, as well as increasing Noatak test net catches, provided a basis for an increase in fishing time to the normal 36 hour period schedule on August 7. Continued strong catch and catch rates, given the low number of fishermen, in addition to adequate escapement as indicated by strong Noatak test net and Kobuk River subsistence catches, supported an extension to two 48 hour periods per week beginning August 10 for the remainder of the season.

Catch and CPUE both peaked on the 9th period (August 8) when 44,741 chum salmon were sold. Below average catches before the peak could be attributed in part to the poor return of 5 year old chum salmon and the late arrival of 4 year old chums.

Total fishing time allowed was 532 hours, just slightly under the recent ten year average of 535 hours. The normal amount of fishing time compared to the below average return was explained by the low number of fishermen. The number of permit holders ranged from 17 in the 15th period to 138 in the 10th period, no more than 89 percent of the average participation.

Thirty-nine percent of the chum catch was taken in statistical area 331-01, adjacent to the Baldwin Peninsula (Table 10A and Figure 5). Forty two percent was taken in area 331-02 (Sisaulik) and twelve percent was taken in newly created statistical area 331-06, in the area between Cape Blossom and Riley Wreck. The boundary was extended last year to include this area, but in 1988 the catch from this area was included in stat area 331-01 harvest reports. Fishermen will fish in different statistical area's throughout the season. Eighty-one percent of the permit holders participated in area 331-01 during at least one period of the fishing season. Seventy-two percent of the fishing effort occurred in area 331-02, seventeen percent in 331-03 (near Noatak River mouth), eleven percent in area 331-04 (Kobuk Lake), ten percent in area 331-05 (Northwest Boundary) and twenty seven percent in area 331-06.

1989 chum prices started at $.25 per pound and rose to $.31 per pound. Chinook sold for $2.00 per pound at three buyers, while the fourth buyer paid $1.25 per pound. Average prices for the season were $.28 per pound for chum and $1.72 per pound for chinook (Appendix Table C4). This is the second lowest average price for chum since 1975. Commercial fishermen received approximately $613,823 for

the 1989 commercial catch for an average of $3,720 for each permit-holder who fished (Appendix Table C3).

Four buyers operated shipped salmon in the round. One processing plant operated in Kotzebue this year, cutting and freezing some of the fish purchased from two of the buyers. About 940,000 pounds of chum were headed and gutted, and roe recovered. The roe was brined in Kotzebue. About 700,000 pounds of dressed chum were shipped out by this processor (Appendix Table C.2). No figures were provided on roe. Average weights were 8.5 pounds for chum and 16.4 pounds for chinook.

The age composition of the commercial catch (weighted by period catch) was 0.7 percent, age 3; 77.8 percent, age 4; 20.4 percent, age 5; and 1.0 percent, age 6 (Appendix Table C9). One seven year old, which rarely occurs, was observed in the commercial catch.

Subsistence Fishing

Door-to-door subsistence fishing interviews were conducted in two Kobuk River villages, Shungnak and Noorvik, during the third week of September (Table 12A). Fishermen in both villages reported an abundance of salmon in the river but the continuous rain throughout the summer made for poor fishing and drying conditions. This was especially true of the upper Kobuk (Shungnak) where people were reluctant to continue fishing until weather improved. Much of the salmon caught in July and August spoiled and was unfit for human consumption. Conditions were not so severe near Noorvik where people reported generally good catches of salmon. People were just beginning to fish for whitefish and siifish, (or sheefish, or inconnu) so survey figures do not reflect the substantial fall catches of these species. Residents of Shungnak expressed a need for good fall catches to supplement their low numbers of salvaged salmon.

Hatchery Contribution

Preliminary figures estimate the hatchery contribution to the commercial catch to be 9,300 chum salmon. Revised estimates will be available after additional analysis of the age composition of returning fish.

Escapement

A test fishery was initiated during the 1987 season to evaluate the feasibility of indexing chum salmon escapement in the Noatak River using systematic drift gill net catches. The project continued in 1988, and in 1989 operating from July 17 through August 24, with peak catches occurring on August 14. Although data collected was of limited use in the management of the commercial fishery this year since only two years of data exist for comparison, test net catches indicated a higher level of escapement than the previous two years. Each year the project is continued the data becomes more valuable in providing management with an index of chum salmon timing and escapement to the Noatak River, the largest salmon producer in the area.

Aerial surveys of index spawning streams were precluded during the entire season due to continued poor weather and high water. Ground surveys were conducted on the lower Kobuk and Noatak Rivers to collect information on the age, sex, and length of fish escaping to these areas. Scale analysis indicates an age composition similar to that of the commercial catch. This information will be available in the annually published Norton Sound/Kotzebue Sound Catch and Escapement report series.

1990 Commercial Season Summary

The 1990 commercial harvest of salmon in the Kotzebue district totalled 163,263 chum salmon, 604 Dolly Varden and 32 chinook salmon, (Table 10B). One hundred and fifty-three permit holders fished at least one fishing period during the 1990 commercial salmon season, which ran from July 9 to August 10. The chum salmon harvest was 49.9 percent of the recent 11 year average (1979-1989) of 327,240 salmon. This low harvest is due to poor returns and because of emergency closure of the season after the tenth period, which cut the season 5 periods short compared to most years. The 1990 chum harvest is the third lowest since 1979. The 163,263 chum caught in ten periods this year is 59.5 per cent of the first ten periods catch of the 11 year average which was 274,560 chum salmon. The five periods which were not fished this year contribute, on average, 16.1 per cent of the season's catch. If fishing had continued through 15 periods in 1990 at average catch, the total projected chum harvest would have been about 195,000.

Commercial catches during the first five periods constituted a declining trend compared to the 11 year average, but CPUE was consistent with or above the 11 year average until the fifth period, when CPUE fell to 72 percent of the norm.

The 6th period showed an increase in catch, and the CPUE was close to average. This portion of the of the season is made up largely of Kobuk River stock. Phone surveys of Kobuk River villages indicated good escapement. With fishing effort consistently low this year, fishing time was extended to 36 hours in the 7th period.

Catch and CPUE peaked on the 7th period. Periods 8 and 9 continued at 36 hours, the established standard for August. By the end of the ninth period, escapement indices on the Noatak River indicated low chum salmon returns, and fishing time was reduced to 24 hours for the next period.

The resulting catch in the tenth period was 36.8 per cent of the 11 year average, with CPUE near normal. The low catch can be attributed in part to low fishing effort (121 fishermen compared to an average of 153) and to reduced period length (24 hours compared to a 45 hour average in the recent 11 years). It was largely on the basis of an aerial survey of the Noatak River on August 8th, which showed only 25 per cent of the escapement goal in the river at a time when 50 per cent might be expected. This led to an emergency closure of the 1990 salmon season.

Total fishing time allowed was 276 hours, about 52 percent of the 11 year average of 535 hours, or 85.7 per cent of the 322 hours which occur during the first ten

periods for the eleven year average. Total boat hours for 1990 were 27,168 which was 43.4 per cent of the eleven year average of 62,591 boat hours and 63.6 per cent of the first ten periods for the eleven year average, 43,012 boat hours.

Commercial fishermen received approximately $440,049 for the 1990 commercial catch (for chum, kings and Dolly Varden) for an average of $2,876 for each permit holder who fished this year (Appendix Table C3). This was or will be augmented by cash bonuses based on number of pounds sold to a particular buyer. Prices were constant throughout the 1990 season. Buyers paid $.30 per pound for chum, $2.00 for kings, and $.25 per pound for Dolly Varden (Appendix Table C4). Average weight was 8.9 pounds for chum and 16.8 pounds for kings.

Four buyers operated, two sending fish out in the round, and two sending all their fish through a processing plant which operated at increased capacity this year. There were 97,456 chum, 20 kings, and 437 Dolly Varden headed, gutted, and iced for air shipment, for a total of 669,411 dressed pounds. Roe was processed at the plant but there were no figures on the amount processed.

Subsistence Fishery

Door to door subsistence fishing interviews were conducted in Noorvik and Noatak villages during the first week of October and November (Table 12B). Fishermen in both villages reported an adequate abundance of salmon in both the Noatak and Kobuk Rivers during the month of September. Residents of both villages indicated that the availability of salmon was poor during the commercial fishing season. These statements accurately reflect the status of both the Noatak and Kobuk stocks during the commercial fishing season. Unusually low water conditions and cool dry weather, during the month of August and September, provided excellent conditions for the seining and drying of salmon.

Residents of Noatak and Noorvik indicated that catches of both whitefish and Dolly Varden were also good during the month of October. Kotzebue residents report excellent catches of siifish during the early winter months of November and December.

Escapement

Aerial surveys flown during the 1990 season provided mixed results. The Kobuk River drainage surveys in general indicated adequate escapements with the exception of the Squirrel River where the survey was well below the objective. The Noatak was only surveyed before and after peak spawning due to poor weather conditions (Appendix Table C8). Surveys indicated the escapement was only 60-75% of the goal set for that system. The test fishery on the lower Noatak showed low catches as well, indicating a weak run. Fall floods during 1986 could have caused poor survival rates of the 4 year old age class.

Hatchery Contribution

Preliminary figures estimate the hatchery contribution to the 1990 commercial catch was 20,000. The total 1991 Sikusuilaq Hatchery return is expected to be roughly 40,000 chum salmon.

1991 Commercial Season Summary

Commercial harvests in the Kotzebue District for 1991 were 239,923 chum salmon, 44 chinook salmon, and 6,136 Dolly Varden (Table 9C). There were 142 permits that fished in 1991. This catch was substantially higher than the outlook of 75,000 to 175,000 but 24 percent lower than the recent 12 year (1979-1990) average. A predicted poor return caused fishermen to find alternative sources of income thereby decreasing the number of permits fishing (180 permits is the recent 10-year average). The chum salmon return was also below average in 1991 when compared to the recent 12 years.

Unlike 1990, the fishing season was completed with 15 openings for a total of 540 hours and an average of 36 hours of fishing per period. This was slightly higher than the recent 12 year average of 531 hours with an average of 35.4 hours per period.

The Kotzebue Sound commercial salmon season was opened July 11 by, emergency order as established by regulation. The first 3 periods harvest rate were under the recent 12 year average (Figure 7) so the fourth opening was announced for 24 hours in length. Reports from districts immediately to the south indicated the chum run might be late in showing. The fourth period catch rate was above average and brought the total catch up to near average. This indicated a normal run strength and warranted a typical fishing schedule.

The next 5 commercial openings were 36 hours in length. Catch rates of periods 5 through 8 were average although total commercial catches were lower than normal due to fewer permit holders participating in the fishery. A dramatic decrease of catch rate and commercial catch occurred during the 9th opening. Because of this drop, it was felt conservative action should be taken. The next commercial opening was decreased by 12 hours.

The 10th commercial opening had the second highest catch rate within the recent 12 year history and was more than two times greater than average for that period. This indicated that a large pulse of fish was moving through, adequate escapement was assured, and that fishing time could be increased. Commercial openings were extended to 48 hours for the rest of the season. During these periods, both catch rates and commercial catches were at or slightly above average.

The older age class (age-5) fish tend to dominate the earlier commercial openings with the younger age classes moving through during the latter part of the fishery (Appendix Table C.9.). The age comparative composition during 1991 indicates that the chum salmon run was late. The age-5 fish were more dominant than the age-4 fish during the first four openings when compared to the 12 year average age composition by date. These two age classes followed the average closely during the middle part of the season. During the latter third of the fishery,

the age-5 fish closely followed the historic average harvest for age-5 chum salmon, while the age-4 component tended to be higher than would be expected on an average year. This difference was most likely caused by a lack of age-3 fish. Historically, this group has made up to a third of the catch with a 12 year average between 20-25 percent contribution. During the last opening the age-3 fish decreased with an increase of age-4. This may be hatchery related as most hatchery fish returned late and were also predominately age-4 dominant.

Three buyers purchased a total of 1,951,041 pounds of chum salmon (average weight 8.1) at $.22 per pound, 714 pounds of chinook salmon (average weight 16.2) at an average of $1.94 per pound, and 40,747 pounds of Dolly Varden (average weight 6.6) at an average of $.18 per pound (Appendix Table C4). The total value was $437,948 to Kotzebue area fishermen with an average of $3,063 for each participating permit holder (Appendix Table C3). All buyers ice packed their fish and flew them to Anchorage for processing.

1992 Outlook

The outlook for the 1992 season is based on the returning age classes of the 1991 season. During the 1992 season the four year old age component of the return is expected to be well below average, but the five year old component is expected to be near normal, as is the three year old component. The commercial harvest is expected to fall within the range of 200,000 to 300,000.

Table 9 A. Kotzebue District commercial catches of chum salmon, chinook salmon, and Dolly Varden by period, 1989.

Period	Dates	Hours	Number of Fishermen	Chum			Chinook			Dolly Varden		
				Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	7/10–7/11	24	53	2,312	20,619	8.9	1	29	29.0			
2	7/13–7/14	24	74	5,950	52,519	8.8	17	273	16.1			
3	7/17–7/18	24	90	11,397	100,942	8.9	5	107	21.4			
4	7/20–7/21	24	97	8,381	74,281	8.9	10	155	15.5			
5	7/24–7/25	28	103	16,145	141,739	8.8	7	133	19.0			
6	7/27–7/28	24	108	12,736	110,965	8.7	6	103	17.2			
7	7/31–8/01	36	122	24,918	218,642	8.8	7	93	13.3			
8	8/03–8/04	24	123	28,887	252,498	8.7	8	98	12.3			
9	8/07–8/08	36	127	44,741	384,499	8.6	3	53	17.7			
10	8/10–8/12	48	138	42,046	345,116	8.2	8	160	20.0			
11	8/14–8/16	48	126	31,787	261,125	8.2	5	106	21.2	1,992	12,816	6.4
12	8/17–8/19	48	80	7,973	64,048	8.0	2	28	14.0	827	5,505	6.7
13	8/21–8/23	48	65	10,408	82,552	7.9	4	46	11.5	225	1,607	7.1
14	8/24–8/26	48	35	4,545	35,229	7.8	2	15	7.5	32	262	8.2
15	8/28–8/30	48	17	2,391	18,400	7.7	2	27	13.5	17	103	6.1
Totals	7/11–8/31	532	165	254,617	2,163,174	8.5	87	1,426	16.4	3,093	20,293	6.6

Table 9 B. Kotzebue District commercial catches of chum salmon, chinock salmon, and Dolly Varden by period, 1990.

Period	Dates	Hours	Number of Fishermen	Chum		Chinook		Dolly Varden	
				Number	Avg. Wt.	Number	Avg. Wt.	Number	Avg. Wt.
1	7/09–7/10	24	43	3,059	9.1	1	15		
2	7/12–7/13	24	44	3,293	9.0				
3	7/16–7/17	24	73	7,273	8.8	4	21.3		
4	7/19–7/20	24	76	11,640	8.6	1	11.0		
5	7/23–7/24	24	103	11,810	9.1	1	12.0		
6	7/26–7/27	24	114	20,670	9.0	6	18.3	8	7.3
7	7/30–7/31	36	126	37,047	9.2	3	9.3	91	7.0
8	8/02–8/03	36	129	23,206	8.7	7	21.0	70	6.7
9	8/06–8/07	36	117	26,272	8.8	4	11.3	146	7.3
10	8/09–8/10	24	121	18,993	8.8	5	16.8	289	6.0
Totals	7/09–8/10	276	153	163,263	8.9	32	16.8	604	7.0

Table 9.C Kotzebue District commercial catches of chum salmon, chinook salmon, and Dolly Varden by period, 1991

Period	Dates	Hours	Number of Fishermen	Chum			Chinook			Arctic Char		
				Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	7/11–7/12	24	26	1,330	11,335	8.5						
2	7/15–7/16	24	62	4,139	35,760	8.6						
3	7/18–7/19	24	62	3,602	28,949	8.0						
4	7/22–7/23	24	87	14,505	122,073	8.4	4	72	18.0			
5	7/25–7/27	36	102	24,624	201,272	8.2	1	35	35.0	29	163	5.6
6	7/29–7/31	36	101	21,631	175,875	8.1	1	23	23.0	2	13	6.5
7	8/01–8/03	36	105	23,371	194,912	8.3	2	23	11.5			
8	8/05–8/07	36	102	26,273	214,490	8.2	2	37	18.5	4	32	8.0
9	8/08–8/10	36	68	7,109	56,060	7.9	2	27	13.5	9	72	8.0
10	8/12–8/13	24	104	37,313	304,700	8.2				370	2,352	6.4
11	8/15–8/17	48	115	35,994	289,993	8.1	10	167	16.7	2,753	17,939	6.5
12	8/19–8/21	48	102	21,845	175,833	8.0	10	147	14.7	2,451	16,534	6.7
13	8/22–8/24	48	69	7,161	55,365	7.7	4	69	17.3	363	2,576	7.1
14	8/26–8/28	48	46	7,083	53,957	7.6	6	96	16.0	141	962	6.8
15	8/29–8/31	48	32	3,943	30,467	7.7	2	18	9.0	14	104	7.4
Totals	7/11–8/31	540	142	239,923	1,951,041	8.1	44	714	16.2	6,136	40,747	6.6

Table 10 A. Kotzebue District commercial chum salmon, chinook salmon, and Dolly Varden catch by statistical area, 1989.

Statistical Area	Number of Fishermen	Chum			Chinook			Dolly Varden		
		Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
331-01	134	98,615	829,356	8.4	20	328	16.4	446	2,754	6.2
331-02	120	107,038	909,134	8.5	31	532	17.2	2,172	14,278	6.6
331-03	28	9,535	82,141	8.6	4	58	14.5	62	406	6.5
331-04	18	3,785	32,824	8.7	1	41	41.0	9	62	6.9
331-05	17	4,464	37,373	8.4	3	62	20.7	307	2,160	7.0
331-06	45	31,180	272,346	8.7	28	405	14.5	97	633	6.5
Totals	153	254,617	2,163,174	8.5	87	1,426	16.4	3,093	20,293	6.6

Table 10 B. Kotzebue District commercial chum salmon, chinook salmon, and Dolly Varden catch by statistical area, 1990.

Statistical Area	Number of Fishermen	Chum			Chinook			Dolly Varden		
		Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
331-01	125	68,561	603,231	8.8	8	99	12.4	130	819	6.3
331-02	99	57,186	522,515	9.1	11	203	18.5	222	1,572	7.1
331-03	21	5,682	51,074	9.0	2	21	10.5	5	38	7.6
331-04	23	6,267	54,749	8.7	1	19	19.0	2	12	6.0
331-05	22	13,350	121,954	9.1	4	57	14.3	185	1,369	7.4
331-06	24	12,217	106,210	8.7	6	138	23.0	60	409	6.8
Totals	153	163,263	1,459,733	8.9	32	537	16.8	604	4,219	7.0

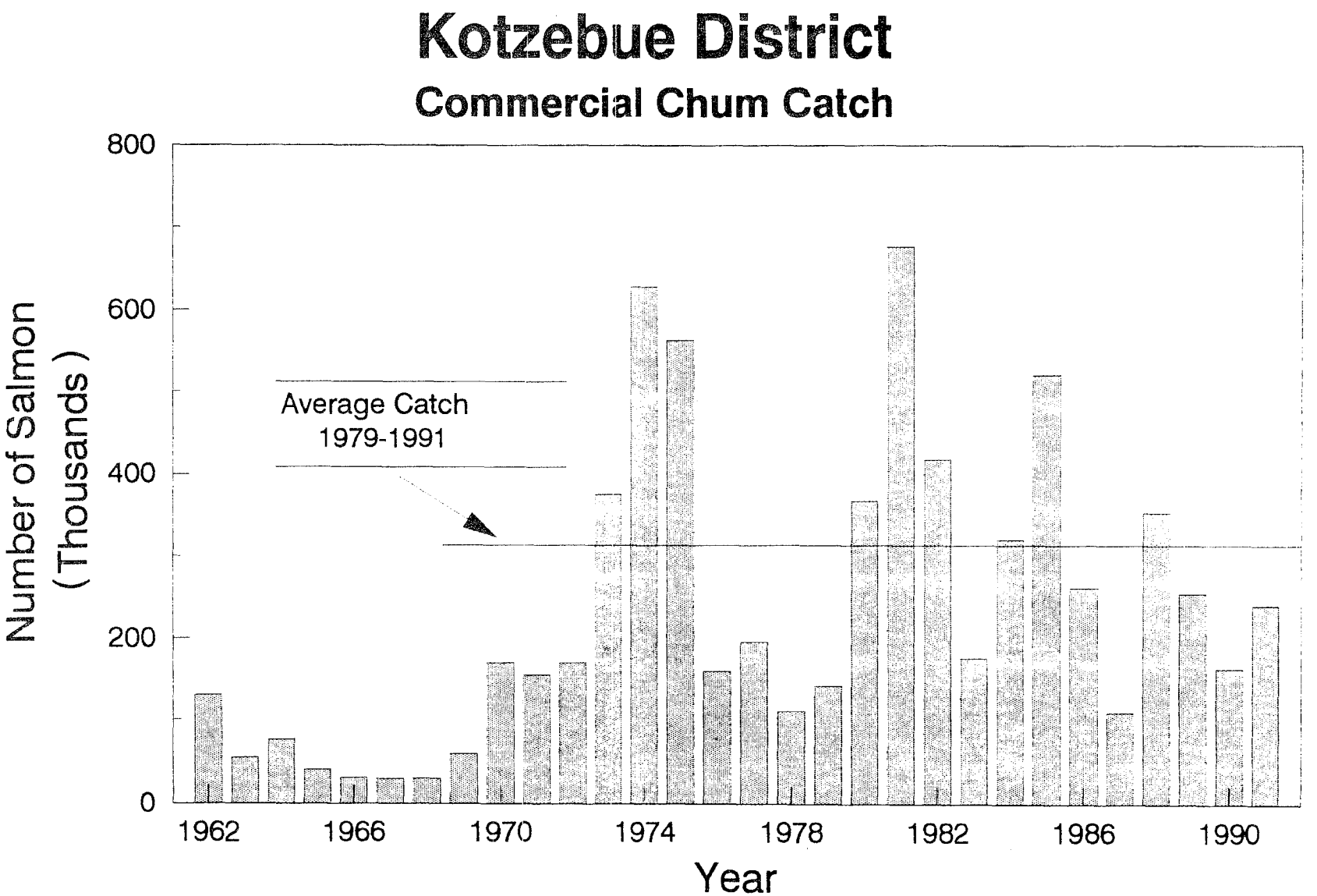


Figure 6. Kotzebue district chum salmon commercial catch by year, 1962-1991.

Table 10 B. Kotzebue District commercial chum salmon, chinook salmon, and Dolly Varden catch by statistical area, 1990.

Statistical Area	Number of Fishermen	Chum			Chinook			Dolly Varden		
		Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
331-01	125	68,561	603,231	8.8	8	99	12.4	130	819	6.3
331-02	99	57,186	522,515	9.1	11	203	18.5	222	1.572	7.1
331-03	21	5,682	51,074	9.0	2	21	10.5	5	38	7.6
331-04	23	6,267	54,749	8.7	1	19	19.0	2	12	6.0
331-05	22	13,350	121,954	9.1	4	57	14.3	185	1.369	7 4
331-06	24	12,217	106,210	8.7	6	138	23.0	60	409	6.8
Totals	153	163,263	1,459,733	8.9	32	537	16.8	604	4,219	7.0

Table 10 C. Kotzebue District commercial catch of chum salmon, chinook salmon and Dolly Varden by statistical area, 1991.

Statistical Area	Number of Fishermen	Chum			Chinook			Dolly Varden		
		Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
331-01	132	129,438	1,045,376	8.1	12	222		1,105	6,927	6.3
331-02	60	30,706	259,588	8.5	12	194		2,021	13,247	6.6
331-03	20	5,242	43,221	8.2				127	747	5.9
331-04	23	18,232	145,957	8.0	5	93	18.6	61	469	7.7
331-05	32	18,258	149,670	8.2	2	20	10.0	2,413	16,792	7.0
331-06	38	37,732	304,589	8.1	13	185	14.2	409	2,565	6.3
331-07 [a]	1	315	2,640	8.4						
Totals	142	239,923	1,951,041	8.13	44	714	16.23	6,136	40,747	6.64

[a] Noatak River test fish sales.

Table 11 A. Kotzebue District villages surveyed for subsistence catch of chum salmon, 1989.

Village	Number of Households Interveiwed	Salmon Harvest	Average Catch per Fishermen
Noatak	12	1,595	133
Shungnak	18	3,894	216
Total [a]	30	5,489	183

[a] Subsistence catch estimats represent only households interveiwed.

Table 11 B. Kotzebue District villages surveyed for subsistence catch of chum salmon, 1990.

Village	Number of Households Interveiwed	Harvest Salmon Harvest	Average Catch per Fishermen
Noatak	29	3,915	135
Shungnak	22	4,353	198
Total [a]	51	8,268	162

[a] Subsistence catch estimated by direct interveiws. Resulting estimates were expanded for subsistence fishermen not contacted.

Table 11 C. Kotzebue District villages surveyed for subsistence catch of finfish, 1991.

Village	Number of Households Interveiwed	Number			
		Chum	Dolly Varden	White Fish	Siifish
Noatak	26	3,777	4,520	3,300	0
Noorvik	22	6,855	240	4,470	553
Shungnak	18	5,288	54	10,865	1,627
Total [a]	44	9,065	206	18,635	2,180

[a] Subsistence catch estimats represent only households interveiwed.

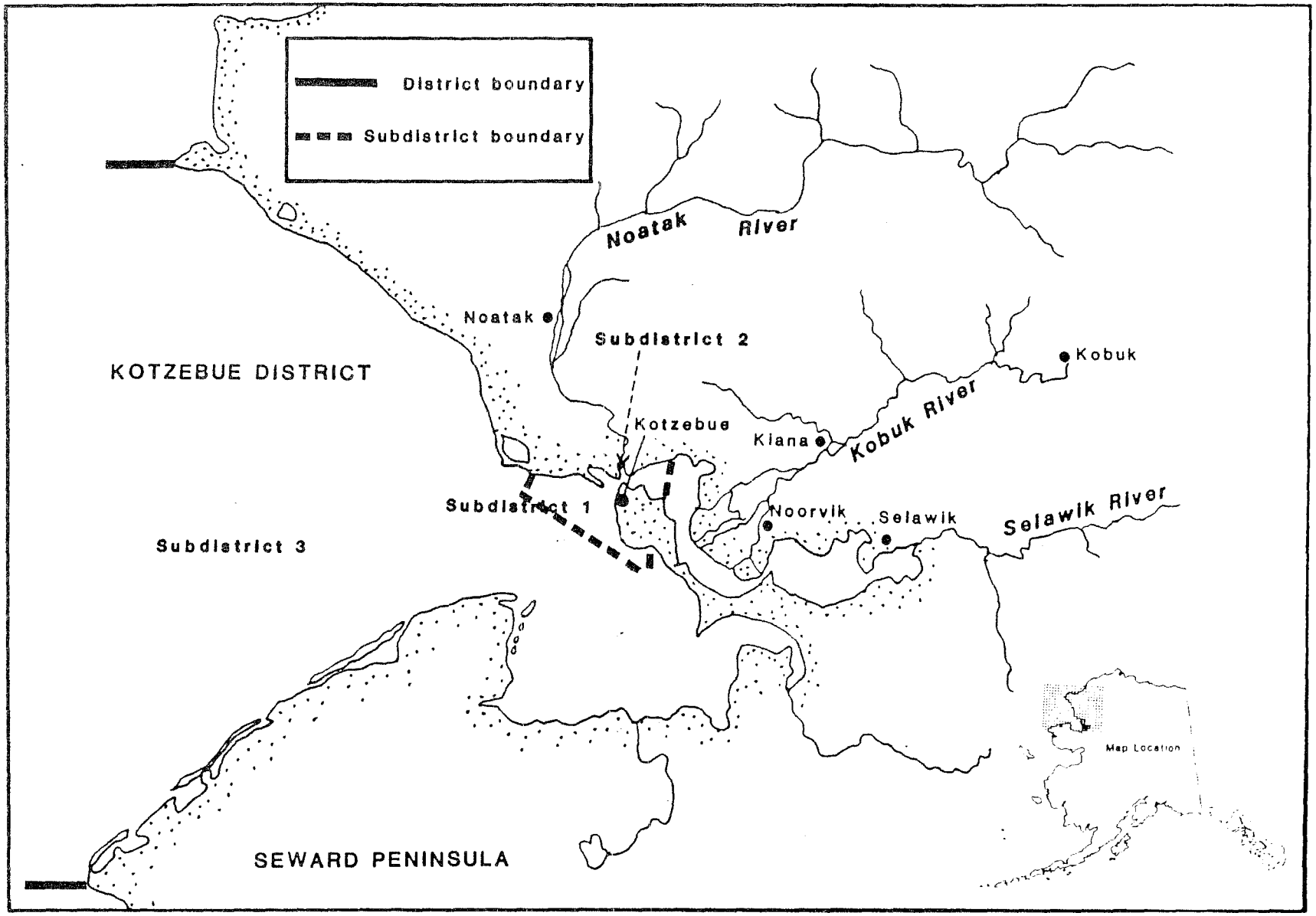


Figure 4. Kotzebue District.

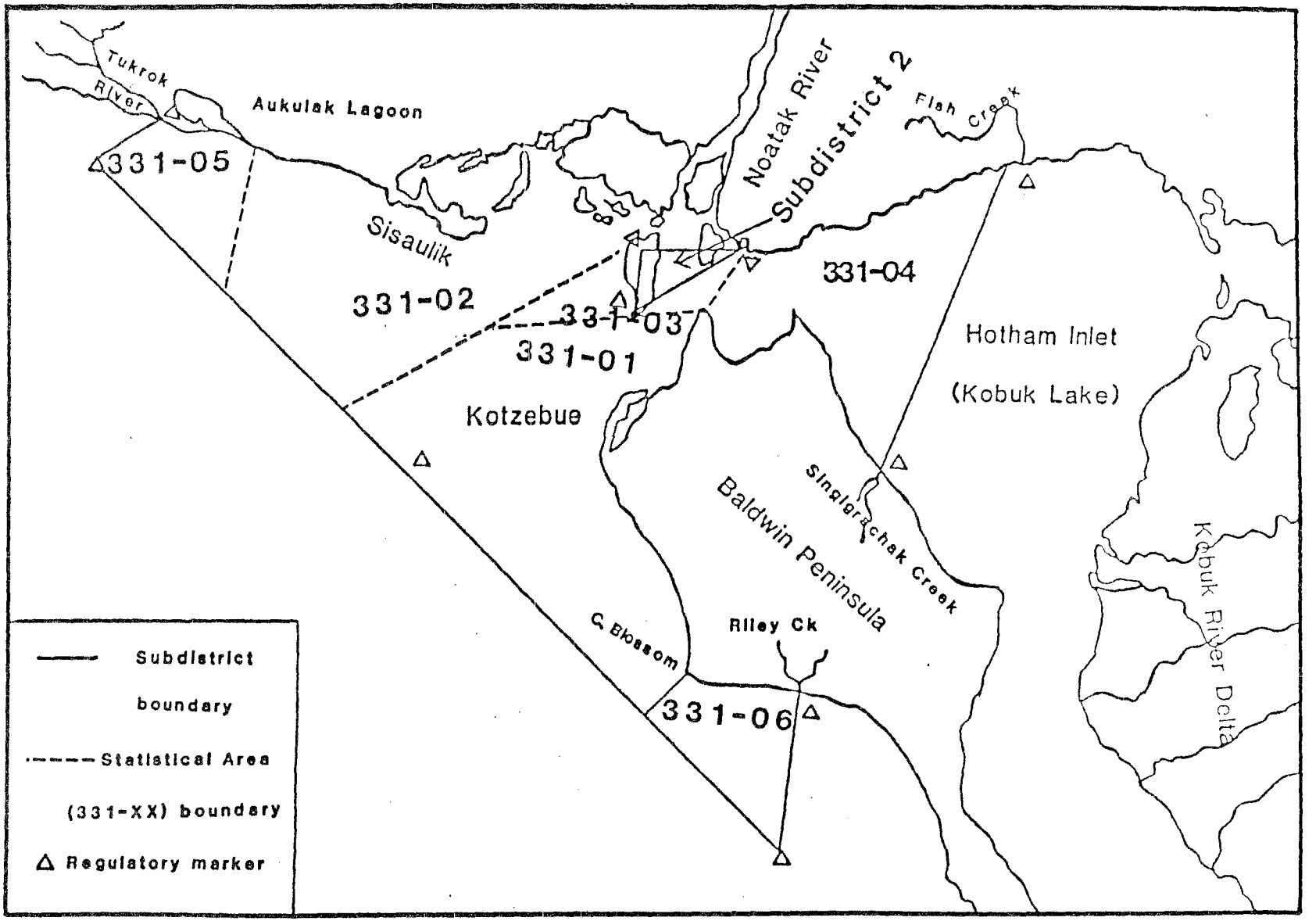


Figure 5. Kotzebue district commercial salmon fishing areas

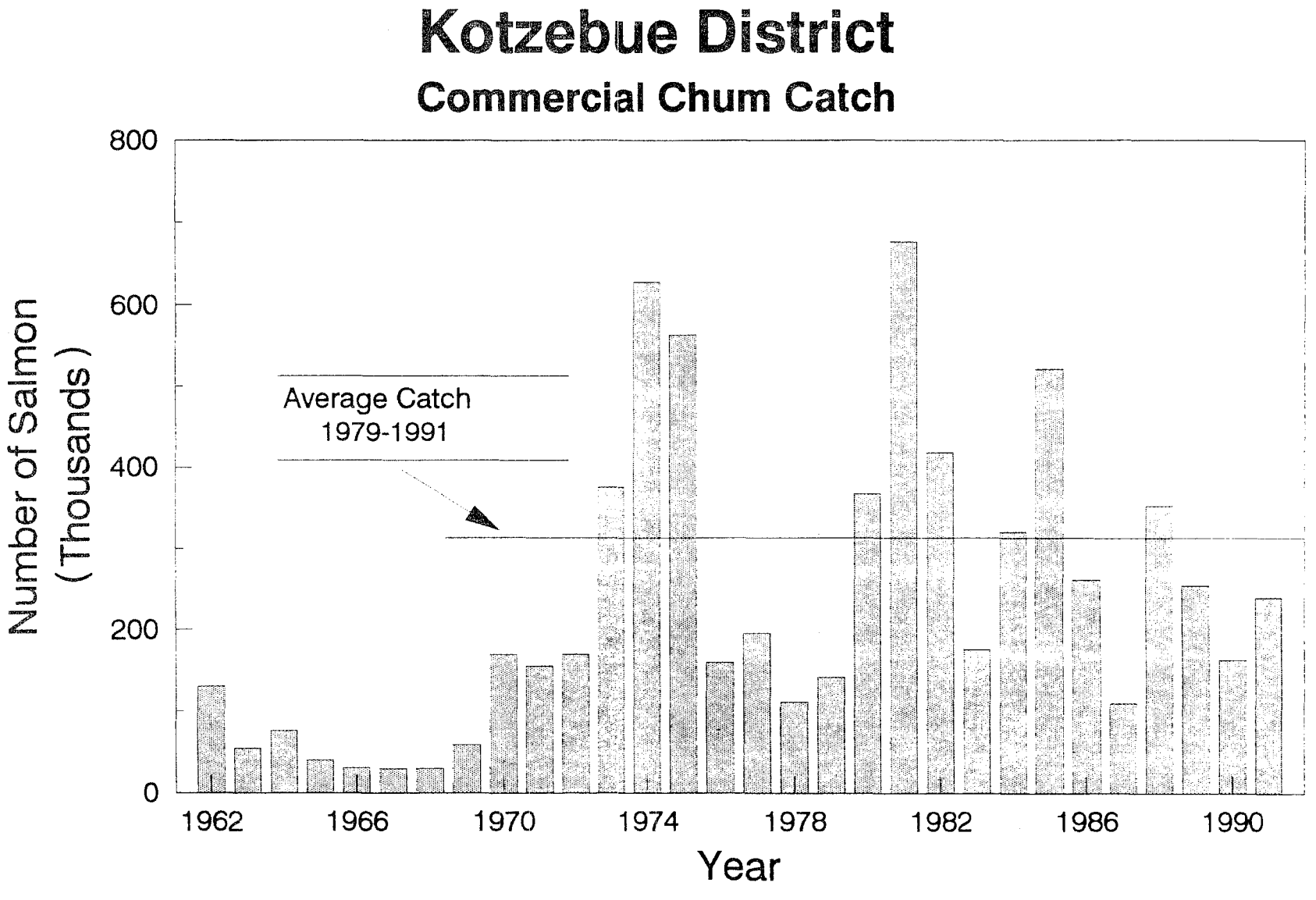


Figure 6. Kotzebue district chum salmon commercial catch by year, 1962-1991.

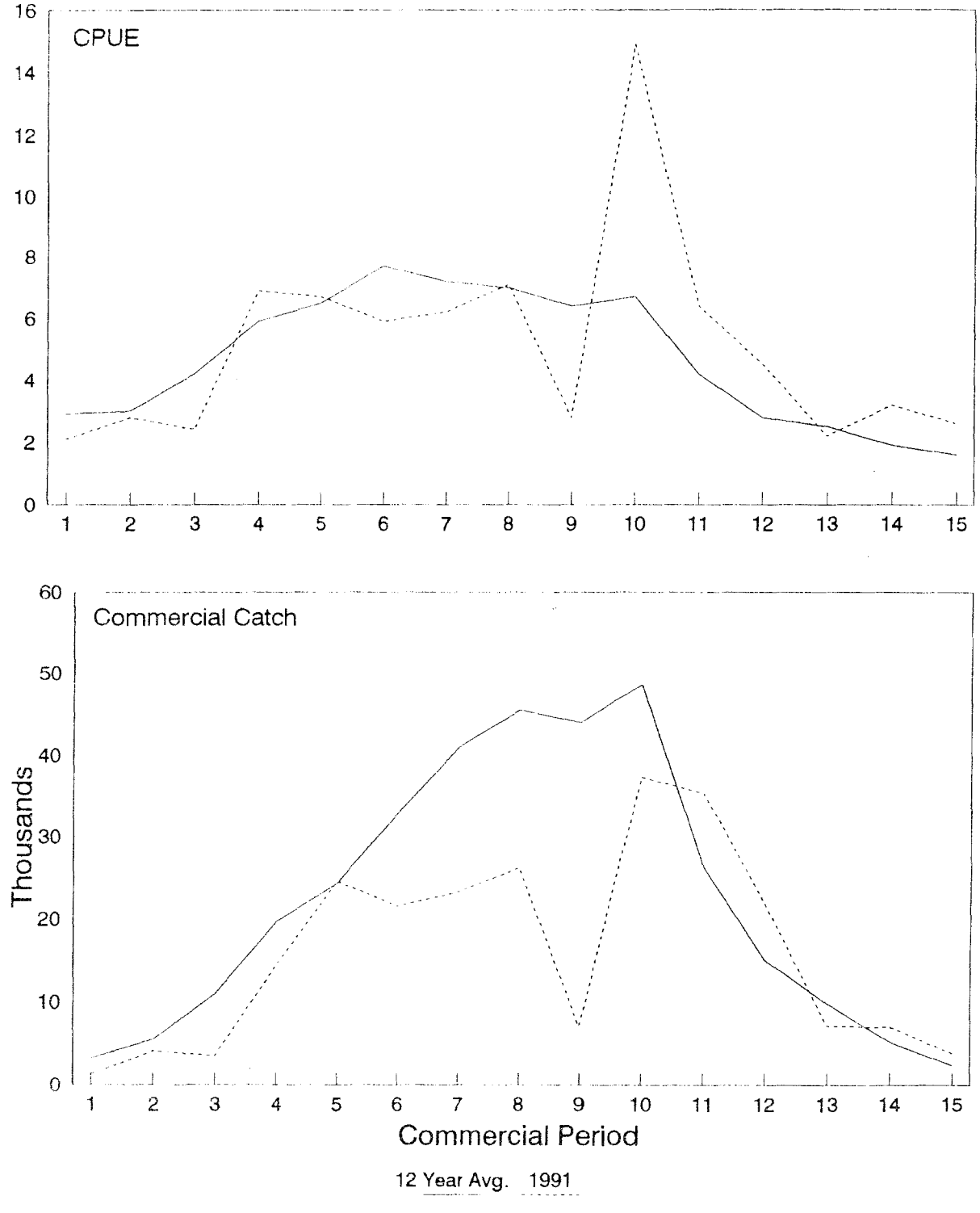


Figure 7. Kotzebue district 1991 chum salmon commercial catch and CPUE versus the 12 year average (1979-1990).

Appendix Table C 1. Kotzebue District chum salmon commercial catch statistics, 1962–1991.

Year	Total Catch	Total Days [a]	Total Boat Days [b]	Average Catch per Boat Day	Number of Fishermen [c]	Average Seasonal Catch per Fishermen
1962	129,948	21.0	793	164	84	1,547
1963	54,445	20.0	693	79	61	893
1964	76,449	27.0	560	137	52	1,470
1965	40,025	32.0	410	98	45	889
1966	30,764	35.0	548	56	44	699
1967	29,400	33.0	556	53	30	980
1968	30,212	34.0	858	35	59	512
1969	59,335	40.0	798	74	52	1,141
1970	159,664	32.0	1,368	117	82	1,947
1971	154,956	29.0	1,468	106	91	1,703
1972	169,664	35.0	2,095	81	104	1,631
1973	375,432	25.0	2,217	169	148	2,537
1974 [d]	627,912	32.0	3,769	167	185	3,394
1975 [e]	563,345	39.0	4,301	131	267	2,110
1976	159,656	16.0	2,236	71	220	726
1977	195,895	21.0	2,353	83	224	875
1978	111,533	23.0	2,738	41	208	536
1979	141,545	21.0	2,462	57	181	782
1980	367,284	27.0	2,559	144	176	2,087
1981	677,239	27.0	3,336	203	187	3,622
1982	417,790	23.5	3,115	134	199	2,099
1983	175,762	12.5	1,557	113	189	930
1984	320,206	19.5	2,432	132	181	1,769
1985	521,406	25.5	3,376	154	189	2,759
1986	261,436	15.5	2,049	128	187	1,398
1987	109,467	11.5	1,160	94	160	684
1988	352,915	21.5	2,761	128	193	1,829
1989	254,617	22.2	1,961	130	165	1,543
1990	163,263	11.5	1,760	93	153	1,067
1991	239,923	22.5	1,795	134	142	1,690

[a] Day = 24 hours of open fishing time.

[b] Boat days standarized in 1983 for all prior years. Boat days = number of boats fishing times period length in hours divided by 24. Total boat days = total season boat hours divided by 24.

[c] During 1962–1966 and 1968–1971 figures represent the number of vessels licensed to fish in Kotzebue District, not the number of fishermen.

[d] Includes 6,567 chum salmon from the Deering experimental fishery.

[e] Includes 10,704 chum salmon from the Deering experimental fishery.

Appendix Table C 2. Kotzebue District chum salmon type of processing and weights, 1962–1991.

Year	Chum Salmon				
	Cases (48lbs)	Fresh Frozen (Round weight in pounds)	Other [a]	Fresh Frozen Salmon Roe (pounds)	Cured Pounds
1962	14,500				
1963	5,396				
1964	5,421	202,993			
1965	1,929	207,350			
1966		310,716		13,600	3,065
1967		273,420			11,488
1968		288,500			11,850
1969		455,013			8,183
1970		1,240,000			48,377
1971		1,264,753			27,542
1972		1,547,041			55,376
1973		3,416,431			144,768
1974		5,361,130 [b]			
1975		4,877,313 [c]			
1976		1,415,549	487		
1977		1,846,340	1,075		
1978		1,009,121	32,419		
1979		1,236,429	6,155		
1980		3,160,948	7,828		
1981		6,139,518	2,210		
1982		3,833,051	790	100	
1983		1,647,160	2,449		
1984		2,631,582	1,593		
1985		4,528,379	1,106		
1986		2,271,320	1,691		
1987		900,405	597		
1988		3,060,292	2,120		
1989		2,163,174	1,426		
1990		1,453,040	538		
1991		1,951,041	714		

[a] Chinook and pink salmon.
[b] Includes 36,775 pounds from the experimental commercial fishery at Deering.
[c] Includes 80,801 pounds from the experimental commercial fishery at Deering.

Appendix Table C3. Kotzebue District commercial fishery dollar value estimates, 1962–1991.[a]

Year	Gross Value of Catch to Fishermen	Wholesale Value of Pack[b]	License and Tax Revenue to State
1962	$4,500	$304,500	$11,635
1963	$9,140	$113,316	$6,040
1964	$34,360	$158,020	$5,279
1965	$18,000	$83,294	$2,952
1966	$25,000	$84,630	$2,820
1967	$28,700	$100,450	$4,245
1968	$46,000	$62,000	$2,800
1969	$71,000	[f]	[e]
1970	$186,000	[f]	$5,520
1971	$200,000	[f]	$5,970
1972	$260,000	[f]	[e]
1973	$925,000	[f]	[e]
1974[c]	$1,822,784	[f]	$18,121
1975[d]	$1,365,648	[f]	$16,955
1976	$580,375	[f]	$15,364
1977	$1,033,950	[f]	$19,960
1978	$575,260	[f]	$9,913 [e]
1979	$990,263	[f]	$18,302 [e]
1980	$1,446,633	[f]	$11,820 [e]
1981	$3,246,793	[f]	$11,220 [e]
1982	$1,961,518	[f]	$7,085 [e]
1983	$420,736	[f]	$24,097
1984[g]	$1,148,884	[f]	$39,696 [e]
1985	$2,137,368	[f]	$6,390 [h]
1986	$931,241	[f]	$5,610 [h]
1987	$515,000	[f]	$6,180 [h]
1988	$2,581,333	[f]	$11,150 [h,i]
1989	$613,823	[f]	$8,350 [h]
1990	$438,044	[f]	
1991	$437,948	[f]	

[a] Some estimates between 1962 and 1981 include only chum value which in figures represent over 99% of the total value. Figures after 1981 represent the chum value as well as incidenta species such as char, whitefish and other salmon species.

[b] Based on type of processing when fish were shipped out of the district.

[c] Includes $9,193 from the experimental commercial fishery at Deering.

[d] Includes $17,776 from the experimental commercial fishery at Deering.

[e] Includes permit and vessel fees only.

[f] Information not available.

[g] Includes tendering fees but not cash bonuses.

[h] Includes permit renewal fees only; vessels were not required.

Appendix Table C 4. Kotzebue District mean prices paid per pound to salmon fishermen by species, 1962–1991 [a]

Year	Chum Salmon		Chinook Salmon	Pink Salmon	Inconnu	Dolly Varden
	Average Weight	Average Price				
1962		$0.35 [c]				
1963		$0.35 [c]				
1964	8.3	$0.45 [c]				
1965	9.0	$0.45			$1.30 [3]	
1966	10.1	$0.11			$1.40 [3]	$0.55
1967	9.3	$0.11			$1.50 [3]	$0.75
1968	9.7	$0.14			$0.91 [3]	$0.98
1969	7.5	$0.15			$1.30 [3]	$2.84
1970	8.1	$0.15				
1971	8.1	$0.16			$0.16	$0.17
1972	9.1	$0.17			$0.20	$0.17
1973	9.1	$0.25			$0.30	$0.16
1974 [b]	8.5	$0.34			$0.30	$0.16
1975 [b]	8.6	$0.28			$0.30	$0.30
1976	8.9	$0.41			$0.30	$0.30
1977	9.6	$0.56			$0.30	
1978	9.1	$0.57			$0.30	$0.25
1979	8.8	$0.80				$0.25
1980	8.6	$0.46			$0.10	$0.20
1981	9.1	$0.53			$0.75 [d]	$0.17
1982	9.3	$0.51	$1.25	$0.15	$0.75 [d]	$0.20
1983	9.4	$0.25	$1.08	$0.13		$0.20 [d]
1984	8.2	$0.44	$1.03			$0.25 [d]
1985	8.7	$0.47	$1.25			$0.25
1986	8.7	$0.41	$1.25			$0.20
1987	8.2	$0.57	$1.25			$0.30
1988	8.7	$0.85	$1.98			$0.35
1989	8.5	$0.28	$1.72			$0.28
1990	8.9	$0.31	$2.00			$0.25
1991	8.1	$0.22	$1.64		$0.50	$0.18

[a] Information not available for some species in some years.
[b] Includes price paid to fisherment of Deering during the experimental commercial fishery.
[c] Price per fish.
[d] Limited market with one buyer.

Appendix Table C 5. Kotzebue District commercial and subsistence salmon catches, 1914–1991.

	Commercial Catch			Subsistence Chum Catch			
Year [a]	Chum [b]	Other [c]	Total	Chum	Number of Fishermen Interveiw	Average Catch per Fishermen	Total Documented Catch
1914	8,550		8,550				
1915	4,750		4,750				
1916	19,000		19,000				
1917	44,612		44,612				
1918	27,407		27,407				
1957				298,430 [d]			
1962	129,948	27	129,975	70,283	81	868	200,258
1963	54,445	143	54,588	31,069	67	464	85,657
1964	76,499	5	76,504	29,762	58	513	106,266
1965	40,034		40,034	30,500	89	343	70,534
1966	30,764	1	30,765	35,588	121	294	66,353
1967	29,400		29,400	40,108	135	297	69,508
1968	30,384 [e]		30,384	20,814	65	320	51,198
1969	59,335	48	59,383	29,812	99	301	89,195
1970	159,664		159,664	28,486	164	174	188,150
1971	154,956	1	154,957	23,959	152	158	178,916
1972	169,664	3	169,667	11,085	96	115	180,752
1973	375,432	5	375,437	18,942	101	188	394,379
1974	634,479 [f]	48	634,527	26,729	88	304	661,256
1975	563,682 [g]	36	563,718	27,605	95	291	591,323
1976	159,796	2	159,798	15,765	91	173	175,563
1977	195,895		195,895	9,752	83	117	205,647
1978	111,533	7007	118,540	12,864	85	151	131,404
1979	141,623	910	142,533	14,605	97	151	157,138
1980	367,284	1654	368,938	10,945	111	99	379,883
1981	677,239	237	677,476	17,766	71	250	695,242
1982	417,790	57	417,847	30,133	204	148	447,980
1983	175,762	229	175,991	8,262 [h]	46	180	184,253
1984	320,206	107	320,313	15,508 [h]	66	235	335,821
1985	521,406	63	521,469	13,494 [i]	243	56	534,963
1986	261,436	106	261,542	36,311	837	43	297,853
1987	109,467	44	109,511	j	j	j	109,511
1988	352,915	152	353,067	j	j	j	353,067
1989	254,617	87	254,704	j	j	j	254,704
1990	163,263	32	163,295	j	j	j	163,295
1991	239,923	44	239,967	j	j	j	239,967
1979–1991 Average		286	308,204				

[a] There was no commercial fishing during 1919–1961.
[b] Catches for 1914–1918 are from pack data only. Number of chum salmon estimate at 9.5 per case (#48) and 34 per barrel.
[c] Includes pink, chinook, and sockeye salmon.
[d] Estimated mean annual catches prior to 1957 (study by Raleigh).
[e] Corrected from 1968 annual report due to addition of late catches.
[f] Includes 6,567 chum salmon from the Deering experimental fishery.
[g] Includes 10,704 chum salmon from the Deering experimental fishery.
[h] Partial survey.
[i] Does not include harvest from the villages of Noatak and Kivalina.
[j] Not surveyed.

Appendix Table C.6. Kotzebue District subsistence chum salmon catches by village, 1962–1991.

Year	Village							Village						District Total
	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Kobuk River	Noatak Village	Kotzebue	Deering	Kivalina	Buckland	Candle	Shishmaref	
1962	15,934	3,139	[b]	[b]	2,321	21,394	48,890	[b]	[b]	[b]	[b]	[b]	[b]	70,284
1963	4,304	1,973	755	1,240	200	8,472	16,762	5,835	[b]	[b]	[b]	[b]	[b]	31,069
1964	2,167	783	2,142	3,134	1,020	9,246	12,763	7,753	[b]	[b]	[b]	[b]	[b]	29,762
1965	5,596	1,598	1,340	2,160	877	11,571	5,671	8,058	5,200	[b]	[b]	[b]	[b]	30,500
1966	3,141	433	912	899	625	6,010	19,700	3,640	6,238	[b]	[b]	[b]	[b]	35,588
1967	2,350	1,489	679	1,500	175	6,193	26,512	4,032	3,098	[b]	162	11	100	40,106
1968	2,424	2,488	457	1,600	1,030	7,999	5,490	4,324	2,838	[b]	37	89	37	20,814
1969	1,301	2,458	3,525	2,550	1,655	11,489	14,458	1,768	1,897	[b]	–	200		29,812
1970	6,077	3,457	2,899	3,450	600	16,483	4,120	6,814	1,242	[b]	344	113		29,116
1971	7,144	5,177	2,299	2,653	1,931	19,204	9,919	1,737	763	[b]	155	50	131	31,959
1972	1,744	1,435	1,469	2,665	2,119	9,432	741	1,151	369	[b]	59	113	29	11,894
1973	2,312	4,470	1,529	4,406	1,917	14,634	216	1,172	1,098	[b]	1,722	50	100	18,992
1974	6,809	2,726	1,651	6,243	2,251	19,680	4,330	[b]	1,880	[b]	639	15	200	26,744
1975	4,620	4,320	3,390	9,060	1,755	23,145	1,515	[b]	1,175	[b]	1,540	[b]	230	27,605
1976	1,555	1,579	2,000	4,213	562	9,909	4,448	[b]	1,358	[b]	[b]	[b]	[b]	15,715
1977	891	766	385	1,760	325	4,127	2,125	[b]	3,500	[b]	[b]	[b]	[b]	9,752
1978	2,034	1,493	2,224	4,766	852	11,369	1,495	[b]	[b]	[b]	[b]	50	[b]	12,914
1979	2,155	1,225	2,400	2,947	651	9,378	2,227	[b]	2,000	[b]	1,000	[b]	[b]	14,605
1980	2,229	2,551	660	2,704	350	8,494	2,135	[b]	[b]	[b]	[b]	[b]	[b]	10,629
1981	3,488	1,439	782	2,800	950	9,459	5,465	2,387	295	110	50	[b]	[b]	17,766 [a,c]
1982	7,433	4,918	2,506	4,191	600	19,648	5,479	4,099	807	210	[b]	[b]	[b]	30,243 [a]
1983 [a,d]	277	223	1,062	3,556	368	5,486	4,035	347	219	200	[b]	[b]	[b]	10,287
1984 [a,e]	[b]	[b]	2,990	4,241	[b]	7,231	6,049	88 [a]	1,940	200	[b]	[b]	[b]	15,508
1985	7,015	3,494	3,487	3,115	300	17,411	[b]	13,494	573	[b]	[b]	[b]	[b]	31,478
1986	8,418	[b]	[b]	4,483	[b]	12,901	1,246	36,311	[b]	[b]	[b]	[b]	[b]	50,458
1987	5,092	[b]	[b]	1,975	[b]	7,067	2,921	[b]	[b]	[b]	[b]	[b]	[b]	9,988
1988	7,500	[b]	[b]	6,223	[b]	13,723	[b]	[b]	[b]	[b]	[b]	[b]	[b]	13,723
1989	[b]	[b]	[b]	3,894	[b]	3,894	1,595	[b]	[b]	[b]	[b]	[b]	[b]	5,489
1990	4,353	[b]	[b]	[c]	[b]	4,353	3,915	[b]	[b]	[b]	[b]	[b]	[b]	8,268
1991	6,855	[b]	[b]	4,248	[b]	11,103	3,637	[b]	[b]	[b]	[b]	[b]	[b]	14,740

[a] No household survey, information is from return of mail questionaires.
[b] Not surveyed.
[c] Does not include 310 chum salmon taken in Selawik.
[d] Household surveys were conducted in Noatak, Kivalina, and Shungnak only. Other harvest information is from limited return of mail–in calendars.
[e] Household surveys were conducted in Noatak, Kivalina, Ambler, and Deering. Other harvest information is from limited return of mail–in questionaires.

Appendix Table C 7. Kotzebue District mean subsistence chum salmon catch per fishermen by village, 1962–1991.

Year	Kotzebue	Noatak	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Deering
1962	[a]	1,190	665	350	[a]	[a]	335	[a]
1963	650	800	160	[b]	94	[b]	67	[a]
1964	515	710	220	260	310	[a]	205	[a]
1965	400	810	220	265	190	220	145	[a]
1966	158	820	137	62	76	45	104	[a]
1967	202	914	90	68	49	125	35	[a]
1968	135	220	84	96	33	114	206	[a]
1969	98	760	163	223	235	318	206	[a]
1970	187	242	132	138	242	182	150	[a]
1971	53	148	223	207	177	133	386	[a]
1972	63	74	84	84	244	266	302	[a]
1973	195	36	121	178	305	489	273	[a]
1974	[a]	393	324	181	165	891	450	[a]
1975	[a]	138	210	288	282	647	293	[a]
1976	[a]	212	259	79	250	281	70	[a]
1977	[a]	425	56	38	55	104	41	[a]
1978	[a]	79	88	71	131	265	142	[a]
1979	[a]	114	98	68	160	184	108	[a]
1980	[a]	164	318	213	132	246	88	[a]
1981	213	579	388	131	129	233	317	[a]
1982	84	189	323	246	167	262	200	81
1983 [c]	50	269	139	223	531	254	368	44
1984	44	173	[a]	[a]	214	303	[a]	194
1985	107	[a]	206	116	152	195	50	72
1986	47	69 [d]	271	[a]	[a]	195	[a]	[a]
1987	[a]	225 [d]	189	[a]	[a]	329	[a]	[a]
1988	[a]	[a]	300	[a]	[a]	389	[a]	[a]
1989	[a]	133	[a]	[a]	[a]	216	[a]	[a]
1990	[a]	135	198	[a]	[a]	[a]	[a]	[a]
1991	[a]	145	311	[a]	[a]	283	[a]	[a]

[a] Not Surveyed.
[b] Number of fishermen not known.
[c] Means based on very limited number of mail–in calendars except for the villages of Noatak and Shungnak where interveiws were conducted.
[d] Partial harvest, fishermen were just beginning to fish.

Appendix Table C8. Chum salmon aerial survey counts for the Kotzebue District, 1962–1991[a,h]. (p. 1 of 4)

Stream	1962	1963	1964	1965	1966	1967	1968	1969
Noatak Drainage								
Noatak River below Kelly River	168,000 [d]	1,970 [b,j]	89,798	6,152 [b,j]	101,640	29,120 [b]	39,394	33,945
Eli River	9,080 [d]	35			120		5,502 [f]	68 [f]
Kelly River & Lake	1,818 [d]	600		3,155	570	225	375	150
Noatak River System Total	178,898	2,605	89,798	9,307	102,330	29,345	45,271	34,163
Kobuk Drainage								
Mouth to Kobuk Village								
Kobuk to Pah River				1,750	266		530	
Pah River to just below Selby River		400		500			50	
Selby River mouth & Slough		2,575		500	630	1,625	70	
Selby R. mouth to just below Beaver C.						75	170	
Beaver Creek mouth		1,095			460	795	1,550	
Above Beaver Creek		465			118			
Kobuk River Total	9,224 [d]	4,535	7,985 [g]	2,750	1,474	2,495	2,370	7,500 [c]
Squirrel River	5,834 [d]	2,200	8,009	7,230	1,350	3,332	6,746	6,714
Salmon River	12,936 [d]	1,535	9,353	1,500 [b]	3,957	2,116	3,367	2,561
Tutuksuk River	10,841 [d]	670	2,685		1,383	169	823 [b]	159
Kobuk River System Total	62,977 [c]	8,940	28,032	11,480	8,164	8,112 [c]	13,306	16,934

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C8. Chum salmon aerial survey counts for the Kotzebue District, 1962–1991[a,h]. (p. 2 of 4)

Stream	1970	1971	1972 [b]	1973 [b]	1974	1975	1976	1977 [b]	1978	1979
Noatak Drainage										
Noatak River below Kelly River	138,145	41,075	64,315	32,144	129,640	96,509	44,574	11,221	37,817	19,655 [b]
Eli River			3,286		22,249	1,302	1,205	742 [b]	5,525	1,794
Kelly River & Lake				2,590 [f]	1,381 [f]	3,937	217 [b]	290 [b]	168 [b]	3,200 [b]
Noatak River System Total	138,145	41,075	67,601 [b]	36,034	158,867	101,748	45,906	12,253 [b]	43,510	24,649
Kobuk Drainage										
Mouth to Kobuk Village					2,255					
Kobuk to Pah River	1,753	4,953				1,873	485		269	75
Pah River to just below Selby River	20	2,039	1,865		4,710	3,968	2,037		1,448	183
Selby River mouth & Slough	4,820	3,100	7,400		7,380				211	1,110
Selby R. mouth to just below Beaver C.	2,385	4,720	3,170	920	13,775 [e]	4,861 [e]			53	640
Beaver Creek mouth	4,930	2,000	3,000	850						
Above Beaver Creek			2,720	700						
Kobuk River Total	13,908	17,202	18,155	2,470 [h]	28,120	10,702	2,522 [c]		1,981 [b]	2,008
Squirrel River	4,418	6,628	32,126	12,345	32,523	34,236	7,229	1,964 [b]	1,863 [b]	1,500 [b]
Salmon River	3,000 [b]	5,453	2,073 [b]	6,891	29,190	9,721	1,161		814 [b]	674 [b]
Tutuksuk River	2,000 [b]	1,384 [f]			8,312	1,344 [b]	758		368 [b]	382 [b]
Kobuk River System Total	23,326	30,667	52,354	21,796	98,145	56,003	11,670	1,964	5,026	4,628

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Fleed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C8. Chum salmon aerial survey counts for the Kotzebue District, 1962–1991[a,h]. (p. 3 of 4)

Stream	1980	1981 [b]	1982 [b]	1983	1984	1985 [b]	1986 [b]	1987 [b]	1988 [b]	1989 [j]
Noatak Drainage										
Noatak River below Kelly River	164,474	116,352	20,682	79,773	67,873	45,529	37,227	5,565 [b,j]	45,930 [b,j]	
Eli River	10,277		295	3,044	5,027	855	4,608	2,780	8,639	
Kelly River & Lake	7,416	13,770	11,604	12,137	3,499	1,200	839	950	1,460	
Noatak River System Total	182,167	130,122	32,581	94,954	76,399	45,584	42,374	9,295	56,029	
Kobuk Drainage										
Mouth to Kobuk Village										
Kobuk to Pah River	1,694	18	2,643 [b]	2,147	402	2,048 [f]	531			
Pah River to just below Selby River	2,063	309	598 [c]	2,433	257	241 [f]	511	2,250	1,135 [b]	
Selby River mouth & Slough		8,321 [d,e]	2,454	11,683		711 [f]	673	1,470	820 [h]	
Selby R. mouth to just below Beaver C.	6,925 [d]		7,268	13,011	5,910	3,278 [f]	3,282	1,350	6,890 [b]	
Beaver Creek mouth	784		1,711	3,059						
Above Beaver Creek				1,413	4,052		1,018	3,140	3,050 [b]	
Kobuk River Total	11,466	8,648	14,674	33,746	10,621	6,278 [i]	6,015	8,210	11,895 [b]	
Squirrel River	13,536	9,854	7,690	6,075	5,473	6,145	4,982	3,400 [c]	4,848 [b]	
Salmon River	8,456	4,709	5,392 [c]	1,677	1,471	2,884	1,971	3,333	6,208	
Tutuksuk River	1,165	1,114	1,322	2,637	1,132	5,198	4,257	206	3,122	
Kobuk River System Total	34,623	24,325	29,078	44,135	18,571	20,405	17,225	15,149	26,073	

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C8. Chum salmon aerial survey counts for the Kotzebue District, 1962–1991[a,h]. (p. 4 of 4)

Stream	1990 [B]	1991	Aerial Escapement Goals
Noatak Drainage			
Noatak River below Kelly River	23,345 [b]	82,750	80,000
Eli River	3,000	2,940	
Kelly River & Lake	325 [i]	654	
Noatak River System Total	26,670	86,344	
Kobuk Drainage			
Mouth to Kobuk Village			
Kobuk to Pah River	4,610	9,840	
Pah River to just below Selby River	305	2,780	
Selby River mouth & Slough		1,040	
Selby R. mouth to just below Beaver C.	7,505	5,250	
Beaver Creek mouth			
Above Beaver Creek	2,515	4,155	
Kobuk River Total	14,935	23,065	10,000
Squirrel River	5,500	4,606	11,500
Salmon River	6,335	5,845	7,000
Tutuksuk River	2,275	744	2,000
Kobuk River System Total	29,045	34,260	

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C 9. Kotzebue District commercial age and sex compositon of chum salmon, 1962–1991.[a]

Year	Sample Size	Percent		Percent Age Class			
		Males	Females	Age–3	Age–4	Age–5	Age–6
1962	69	26.1	73.9	7.3	63.3	28.0	1.4
1963	255	35.0	65.0	30.1	50.9	18.6	0.4
1964	463	43.6	56.4	52.9	45.0	1.7	0.4
1965	480	42.1	57.9	2.3	91.0	6.7	0.0
1966	430	40.2	59.8	10.1	67.1	22.8	0.0
1967	1,865	37.3	62.7	8.8	72.2	18.5	0.5
1968	1,989	48.2	51.8	21.2	58.1	19.8	0.9
1969	1,125	53.7	46.3	36.8	58.3	4.9	0.0
1970	267	45.3	54.7	3.9	91.0	5.1	0.0
1971	1,105	54.6	45.4	7.1	66.8	26.1	0.0
1972	980	50.9	49.1	15.8	59.5	24.1	0.6
1973	598	46.0	54.0	16.7	69.5	13.8	0.0
1974	350	47.1	52.9	28.5	63.5	7.8	0.2
1975	340	46.4	53.6	2.5	86.8	10.7	0.0
1976	566	47.9	52.1	11.2	51.5	37.2	0.1
1977	446	49.3	50.7	6.7	73.0	18.6	1.7
1978	579	49.9	50.1	10.5	57.5	31.8	0.2
1979 [b]	658	53.3	46.7	30.6	53.2	15.2	1.0
1980 [c]	710	56.4	43.6	15.1	78.1	6.6	0.2
1981 [d]	1,167	52.4	47.6	2.4	67.1	30.5	0.0
1982	983	48.8	51.2	5.9	48.3	40.3	5.5
1983 [e]	1,979	43.4	56.6	5.8	57.7	34.2	2.3
1984 [f]	2,933	50.2	49.8	14.6	64.4	19.7	1.3
1985 [g]	3,293	47.8	52.2	0.4	83.7	15.5	0.4
1986 [h]	3,095	46.0	54.0	0.3	18.6	78.9	2.2
1987 [i]	1,987	52.0	48.0	15.0	43.0	31.0	11.0
1988 [j]	3,324	48.0	52.0	6.5	74.9	16.9	1.7
1989	3,336	49.3	50.7	0.7	77.9	20.4	1.0
1990 [k]	2,497	49.4	50.6	2.3	45.6	50.7	1.4
12 Year Average (1979–1990)		49.8	50.2	8.3	59.4	30.0	2.3
1991	3,292	46.4	53.6	2.9	60.4	35.8	0.9

[a] Commercial periods not sampled for years 1962 to 1978 are unknown.
[b] Commercial openings 1 and 10 not sampled due to period closure.
[c] Commercial openings 8, 13, and 15 not sampled due to period closure.
[d] Commercial openings 8, 10, 12, and 14 not sampled due to period closure.
[e] Commercial openings 11, 13, 14, and 15 not sampled due to period closure.
[f] Commercial openings 14 and 15 not sampled due to period closure.
[g] Commercial openings 1, 3, 5, 7, 9, 11, and 13 not sampled due to period closure.
[h] Commercial opening 15 not sampled due to period closure.
[i] Commercial openings 1, 2, 4, 6, 7, 8, 10, 11, 14, and 15 not sampled due to period closure.
[j] Includes 0.1 percent age–7 fish.
[k] Commercial openings 11 to 15 not sampled due to period closure.

Section 2: PACIFIC HERRING

(Includes Norton Sound and Port Clarence/Kotzebue Districts)

SECTION 2 - PACIFIC HERRING

INTRODUCTION

Boundaries

The Norton Sound District consists of all waters of Alaska between the latitude of the westernmost tip of Cape Douglas and the latitude of Canal Point Light (Figures 8 and 9). The Port Clarence District consists of all waters of Alaska between the latitude of Cape Douglas and the latitude of Cape Prince of Wales. The Kotzebue District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Hope (Figure 8).

Spawning Areas and Timing

The arrival of herring on the spawning grounds is greatly influenced by climate and oceanic conditions, particularly the extent and distribution of the Bering Sea ice pack. Most herring spawning populations appear near the eastern Bering Sea coast immediately after ice breakup between mid-May and mid-June. Spawning progresses in a northerly direction and may continue into July or August along portions of the Seward Peninsula or within the Chukchi Sea.

The primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. When sea ice has remained in this area into June, spawning has been more extensive along Cape Denbigh and several locations along the northern shore of Norton Sound between Bald Head and Bluff. More northerly spawning areas have been more difficult to identify due to small herring stock sizes and limited investigations. Likely spawning areas include Imuruk Basin, Shishmaref, Deering-Kiwalik, and Hotham Inlet.

NORTON SOUND DISTRICT

Fishing History

Pacific herring (Clupea harengus pallasi) have been utilized for subsistence purposes by coastal residents prior to the mid-1800's when their use was first documented by early explorers. The earliest American commercial effort on Bering Sea herring apparently took place in the early part of this century at Golovin Bay in Norton Sound (Appendix Table D1).

Food Herring

Early records indicate that about 3,200 short tons of "fall herring" were processed in Norton Sound from 1916 to 1941 (Appendix Table D1). This fishery was dependent on salt curing and declined because of poor marketing conditions arising from foreign competition. The Japanese began gillnetting in Norton Sound

during 1968 with three vessels. Effort was concentrated about 12 miles offshore between St. Michael and Golovin. Approximately 40 Japanese vessels reported harvesting a record 1,400 short tons (st) of herring during 1969 (Appendix Table D2). An average annual harvest of approximately 440 st was reported in Norton Sound by the Japanese during 1968-1974. The Japanese gill net fishery was prohibited in 1977.

Sac Roe

Domestic commercial effort resumed in Norton Sound in 1964 near Unalakleet and continued on a sporadic basis until 1979. Between 1964 and 1978 the fishery averaged about 14 short tons of herring annually and targeted on "spring herring" for sac roe extraction (Appendix Table D1).

In 1979, a domestic herring fishery for sac roe began on a larger scale in Norton Sound when approximately 1,292 short tons (st) of herring were taken by 63 fishermen (13 purse seiners, 50 gillnetters). Purse seiners took 70% of the total catch.

After the 1979 season, the Alaska Board of Fisheries adopted a public proposal which made gill nets and beach seines the only legal commercial herring fishing gear within Norton Sound. A purse seine fishery could only be opened if the gill net fleet could not take the allowable harvest. This regulation was an attempt to encourage involvement of local fishermen in this developing fishery. During the 1980 season 294 gill net fishermen harvested 2,452 short tons of herring (Appendix Table D3). Because gill net fishermen demonstrated that they were capable of taking the available harvest a regulation was passed in 1981 which prohibited any purse seine gear within Norton Sound.

Commercial harvests from 1981-1984 averaged 4,137 st, and ranged from a low of 3,662 st in 1984 to 4,582 st in 1983 (Appendix Table D3). From 1985-1988, commercial herring harvests have averaged 4,374 st, ranging from a low of 3,548 st in 1985 to a high of 5,194 st in 1986. And most recently, from 1989-1991, harvests have averaged 5,596 st, ranging from 4,743 st in 1989 to 6,373 st in 1990.

Prior to the 1984 season, the harvest by beach seine fishermen was negligible. During 1984, ten beach seine fishermen harvested 327 st. During their 1984 fall meeting, the Board of Fisheries set a beach seine gear limit of 100 fathoms and limited the harvest to "not exceed 10 percent of the total herring sac roe harvest projection as published by the department." During the fall 1987 Board of Fisheries meetings, beach seine gear was further restricted to a limit of 75 fathoms. Beach seine harvests in since 1985 have averaged 6.3% of the total reported harvest.

Spawn on Kelp

A small scale spawn-on-kelp (Fucus) fishery existed in Norton Sound from 1977 to 1984. Harvests during the 1977-1984 period ranged from less than one ton (1977) to approximately 46 st (1981). In addition, during the 1984 season, one ton of

macrocystus kelp was imported into Norton Sound resulting in a harvest of approximately 3 st of product. In response to a public proposal, a Board of Fisheries action prior to the 1985 season resulted in the closure of all spawn-on-kelp fisheries in Norton Sound (Appendix Table D5).

Management Strategies

The overall statewide management strategy is to annually harvest 0-20% of the herring biomass. The upper end of the exploitation range is applied to stocks in good condition. The lower end of the exploitation range is applied to stocks that are exhibiting a trend of decreasing abundance and poor recruitment.

Herring are long lived fish and will usually remain harvestable for at least 5 years after recruiting into the fishery. Harvesting only a percentage of the biomass ensures that some fish will be held over for following years. This type of strategy helps mitigate population fluctuations caused by successive years of poor recruitment, a common occurrence in marine spawning fish. Prior to 1983, harvests in Norton Sound were regulated on a subdistrict basis so harvests would be dispersed over the entire fishing grounds. This was to prevent harvest efforts from concentrating in one area on what was then thought to be a distinct stock of fish.

COMMERCIAL FISHERY

The Norton Sound herring fishery has opened by emergency order during the 1989, 1990 and 1991 seasons on May 27, 28 and 23 respectively. During 1989, three gill net openings were allowed for a total of 10 hours of fishing time and four beach seine openings were allowed for a total of 14 hours of fishing. During 1990, four gill net openings allowed 19 hours of fishing and three openings totalled 8 hours for beach seining. During 1991, two gill net openings totaled 11 hours and two beach seine openings totaled 4 hours. The gill net catch rate was surprisingly high. The catch rate was affected by the concentration of herring and the exclusion of some less efficient fishermen, both caused by pack ice concentrated in southern Norton Sound during the 1991 season.

The number of fishermen participating in the Norton sound fishery is now limited. Eventually, 301 gill net and 4 beach seine permits are all that will be issued. During the 1989, 1990 and 1991 seasons, 357, 365 and 279 fishermen sold herring, respectively (Appendix Table D3). During 1989, a moratorium of new entrants was in effect. In the succeeding years limited entry permits were issued and some fishermen were disqualified. Roughly 40 fishermen from the lower Yukon, Stebbins and St. Michael were blockaded by pack ice during the 1991 season, in part accounting for the decline in effort that year.

Generally, the fisheries management staff has tried to set fisheries openings to allow gillnetters to fish the flood tide as it crests. The belief that the ripe females approach the beach at that time to spawn figures heavily in that strategy. The Norton Sound fishery covers a large area with varying tides. Because the large gill net fleet can not "fit" into individual subdistricts, opening at the optimal time through out the district is not always possible. The fishing fleet must be flexible to maximize catches.

The beach seine openings are dependent on herring abundance near the beach and favorable weather conditions for spotters and fishing. Beach seiners prefer to work flood tides similar to those gillnetters favor, however, fisheries managers frequently provide less optimal fishing times. The beach seiners have shown the ability to harvest their allotment of 10% of the preseason harvest goal in a single three hour opening under ideal conditions. By the nature of the gear beach seiners have the potential to wrap up large numbers of fish greater than their allocation. Therefore, the management staff has reduced the beach seine efficiency by allowing a gillnet opening to occur before the beach seine opening in order to break up school size and reduce the likelihood of a bonanza. During the 1991 season, the typical management scenario was not followed. The beach seine fleet was used to test the roe quality of herring newly arrived in nearshore waters. The herring were of high quality and the beach seiners nearly met the harvest goal in that single first opening. Realizing they were unlikely to get another opening they approached the management staff for a co-opted opening where all beach seine fishermen agreed to split the remainder of the harvest goal and profit through a combined but limited effort. Two vessels, under the direct supervision of management staff, wrapped two schools, pumped only the tonnage needed to reach the goal, then released the excess. This method of management was not the preferred method by the fishermen or the managers. It requires direct supervision by a manager, who must not have any more pressing responsibility.

1989 Fishery Summary

The 1989 total harvest based on fish ticket data was 4,741.0 short tons (st) of herring (Tables 12A and 13A). In addition, approximately 30.0 st were estimated to have been wasted in abandoned gill nets and a beach seine set that was lost. Thus the total catch was 4,771.0 st.

During the 1989 season, 351 fishermen used gill nets, landing a total of 4,351.4 st. The average sac roe recovery for gill net caught herring was 9.3%. Six fishermen participated in the beach seine fishery, landing 389.7 st of herring. The average sac roe recovery for beach seine caught herring was 8.5%. One educational gill net permit (included in gill net totals) was issued by CFEC, and fished by the Bering Straits School District Commercial Fisheries Vocational class immediately following the closure of the commercial gill net and beach seine fisheries. A total of 10.3 st was landed on this permit, and is included in the gill net total harvest.

There were nine companies present on the grounds during 1989 to purchase herring. These 9 companies registered 12 processors and 53 tenders to operate in Norton Sound; a total of 8 processors and 36 tenders were reported to have arrived on the grounds prior to the fishery closure on May 30.

The average sac roe recovery for all gear types was 9.2% Based on final operations reports, the average price advanced for a short ton of 10% roe herring was approximately $555.00. The average price paid to the fishermen for a short ton of 9.2% fish was approximately $514.00. Of the 4741.0 st harvested, 247.3 st were purchased as bait herring (roe % less than 6.0%) for which fishermen

received an average of $51.00 per ton. The total value of the herring harvest to the fishermen was approximately $2,322,274.00.

Fishery Management / Emergency Orders

Aerial survey conditions prior to, during, and after the fishery were predominantly poor to unacceptable (Table 14A). Waters from Wood Point to Shaktoolik had been ice free since early April. Wind conditions prior to the fishery caused very turbid waters which only began to clear up in a few places well after the commercial fishery began. Shore ice was present on the inner St. Michael Bay, north side St. Michael Island, south side Stuart Island, on the west and north sides of Cape Denbigh, in Norton Bay, along the Elim coast, and in Golovin Bay shortly before the fishery. Shore ice was also present at Stebbins and in Pastol Bay up to the fishery, however, the ice began to move out by the second gill net opening (May 28). Ice conditions changed rapidly in the Cape Denbigh and St. Michael areas, by the time of the fishery, waters were predominantly ice free in the major portion of subdistricts 1, 2, and 3. Winter weather conditions prevailed in the northern subdistricts (sd's 4, 5, 6, and 7) until well after the fishery which took place in the southern subdistricts.

The initial survey of the season was flown on May 16; this survey was an ice survey, and was rated unacceptable for viewing of any biomass that may have been present on the grounds. Aerial surveys scheduled early in the week of May 22 were canceled or postponed due to ice fog and snow squalls. The May 23 survey was also unacceptable due to turbid waters and fog. A survey flown on May 24 documented the first biomass sighting in subdistrict 1, but was again under unacceptable conditions; however, this survey did document the first spawning activity in the ice free areas of subdistrict 1, from Klikitarik Point to Leibes Cove. At this time, it was apparent that the spawning biomass was arriving on the grounds, and the viewing conditions for estimating the biomass were going to remain poor and the fishery would likely have to be managed using the preseason biomass and harvest guidelines.

The May 25 survey documented increasing biomass and spawning activity, and was rated fair overall. Approximately 14 linear miles of spawn was documented from Tolstoi Point to Cape Stephens. On May 26, two surveys were flown. The first documented approximately 5,000 st of biomass and 19.3 linear miles of new spawn. The second survey, flown later in the day, saw less biomass and documented 5 linear miles of fresh spawn. Both surveys on May 26 were rated fair to poor due to turbid waters from mud and milt.

Unlike the 1988 season, the large vessel commercial fleet began to arrive on the grounds on May 24, prior to the fishery. With such poor viewing conditions, it was very apparent that the Department would have to rely heavily on test fishing data in order to determine when the fishery should be opened. Herring caught in a 2 7/8" mesh subsistence gill net in St. Michael Bay were obtained on May 24. The sample, upon analysis, showed a 50:50 male to female ratio, with 6.0% mature and 2.5% immature roe. Herring samples taken from Department variable mesh test net catches from near Blueberry Point on May 25 showed more mature roe present.

A beach party was organized for the morning on May 26, with samples scheduled to be brought into Unalakleet, the central location of the ice free waters from Cape Denbigh to Black Point. However, volunteer commercial test fishermen were unable to capture herring south of Unalakleet. Samples obtained from the Beeson Slough area (between Unalakleet and Shaktoolik) were delivered to the beach party. In addition, samples from the 2 1/2" and 3" panels of Department variable mesh gill net catches near Tolstoi Point on May 25 were examined at the beach party. Mature roe percentages at this time ranged from 5.9% to 8.6%. Immature roe was also present, with percentages ranging from 0.8% to 3.0%. Overall, the sex ratio of the samples caught early on May 26 were near 50:50 male to female. Two of the four companies present indicated they were interested in the fishery opening at this time. However, the Department management staff felt that the information was inconclusive due to the small number of samples present, and the limited area from which the samples had been obtained. So, a second beach party was set for later in the day, at 7:00 p.m. Both beach parties were well attended by industry personnel as well as fishermen. The second beach party analyzed samples obtained from nine different locations in southern Norton Sound, from Tolstoi Point to west of Whale Island, near St. Michael Bay. All commercial test samples obtained were from 2 7/8" and 3" mesh gill nets, and found quite a variation of sex ratios and roe maturities. Mature roe percentages ranged from 4.0% to 10.0%, with immature roe percentages ranging from 0% to 6.6%. A few spawned out or partially spawned fish were seen. The overall roe percentages seemed to be lowered by a high male composition in the samples rather than an abundance of immature roe. Given that, there seemed to be no point in delaying the fishery. So, a gill net opening was announced for the morning of May 27, to coincide with the incoming tide. A beach seine opening was announced to shortly follow the gill net opening. Subsequent openings were announced as soon as catch reports were available, and were timed to optimize tide conditions for the gillnetters, and spotting conditions for the beach seiners. Additional factors taken into consideration were timing the fishing periods by gear to allow adequate notice for fleet movement, and sufficient time between periods for Fish and Wildlife Protection to reasonably work the closures.

Aerial surveys continued throughout the commercial fishery openings which occurred from May 27 to May 30, however surveying conditions remained very poor due to spawn and turbid waters. In-season processor verbals indicated a total catch of 4,069.3 st at 8.9% roe by the gill net fleet and 398.0 st at 9.0% roe by the beach seine fleet. Final catch figures based on fish ticket data indicated a harvest reasonably close to the estimated catch in-season (4,351.5 st by gill nets, 389.7 st by beach seines). In-season catch figures were also close to the desired harvest levels as mandated by the preseason guideline harvest management strategy. Catch and effort data based on fish tickets and period times and lengths by gear are shown in Table 12A.

One management action taken during the final (third) gill net opening of May 29 was the restriction of gear to a maximum of one net, not to exceed 50 fathom in length. This first time use of this new regulation which allowed the Department to limit legal gear length by emergency order raised questions by the fishermen and processors, but did not seem to cause confusion among the fishermen. This restricted gear opening, which was 2 hours in length, was an attempt to allow the gill net fleet to harvest what appeared to be 600 st left to fill the guideline

harvest. A few fishermen were observed by industry personnel and other fishermen to be fishing 2 nets, and affidavits based on eye-witness reports are pending.

Although ice was present in Norton Bay and south of Stuart Island during the fishery, winds and currents as well as the timing of the breakup of this ice kept the moving ice from hindering commercial fishing efforts. Ice breakup in the more northern areas (Elim coastline and Golovin Bay) was slow, with some shore ice still present during the June 5 survey, and just moving out as observed during the June 7 survey. A small amount of spawning activity was documented in the Elim area on June 5 while ice breakup was in progress.

Enforcement

Protection efforts in Norton Sound consisted of one single engine aircraft (super cub on wheels) and one Boston Whaler. Personnel consisted of two permanent, full-time Fish and Wildlife Protection officers and one seasonal Fish and Wildlife Protection Aide.

Fish and Wildlife Protection officers patrolled the grounds during each opening and closure. However with the limited personnel and equipment available to patrol the Norton Sound District, just one subdistrict was effectively covered following each period; many public complaints regarding lack of enforcement presence were fielded by Commercial Fisheries staff. A total of 17 citations were issued for the following: 2 citations, one for each count, buying prior to District registration; 3 citations fishing closed period (early); 7 citations fishing closed period (late); 4 citations for illegal beach seine sets; and 1 citation for fisherman without identification. In addition, investigations are pending on abandoned gill net gear, superexclusive use violations, and affidavits concerning eye-witness accounts of fishing extra gear during the last gill net opening. A total of 26.0 st of herring was confiscated by the State of Alaska during the 1989 season. Additional forfeitures are possible following further investigation.

Research

The Department fielded two crews during the 1989 season. One crew operated from Cape Denbigh. A second crew operated from Klikitarik, the traditional test fish site in southern Norton Sound. Use of this site has not been possible in recent years due to loose ice and shore ice conditions. The test fish crews presence and sampling efforts on the herring grounds are critical to the proper management of the fishery and biological documentation of the stocks. As mentioned in the fishery management section, communications between the field office staff and test fish crews were very marginal in-season due to non-functional radio equipment.

Unalakleet field office personnel during the season consisted of the area management biologist, the assistant area management biologist, the area research biologist, and a fisheries technician office monitor/public receptionist. In addition, two fisheries technicians were hired to fulfill additional sampling requirements of a stock identification project implemented during 1989 for the

Bering Sea herring fisheries. The regional herring biometrician was present to provide overall quality control of herring sampling and assistance with sample collection and procedures.

1990 Commercial Season Summary

The 1990 total harvest based on fish ticket data was 6379.4 short tons (st) of herring (Table 12B and 13B). In addition, approximately 60.0 st were estimated to have been wasted in abandoned gill nets. The total catch was thus 6439.4 st.

During the 1990 season, 357 fishermen used gill nets, landing a total of 6032.2 st. The average sac roe recovery for gill net caught herring was 8.7%. Eight fishermen participated in the beach seine fishery, landing 347.2 st of herring. The average sac roe recovery for beach seine caught herring was 9.5% (Table 12B and 13B). The timing of the beach seine fishery was coincidental with the gill net fishery at times but for the most part the two gear types were separated spatially. One educational gill net permit was issued by CFEC, and fished by the Bering Straits School District Commercial Fisheries Vocational class immediately following the closure of the commercial gill net and beach seine fisheries. A total of 8.5 st was landed on this permit, and is included in the gill net total harvest.

There were eight companies present on the grounds during the season to purchase herring. These 8 companies registered 7 processors and 58 tenders to operate in Norton Sound.

The average sac roe recovery for all gear types was 8.8%. The combined sac roe and bait roe percentage was only 7.9% roe due to the 1026.1 st bait harvest. Based on final operations reports, it appears the average price advanced for a short ton of 10% roe herring was approximately $686.00. The average price paid to the fishermen for a short ton of 8.7% fish was approximately $597.00. Of the 6379.4 st harvested, 1026.1 st were purchased as bait herring (roe % less than 7.0%) for which fishermen received an average of $398.00 per ton. The total value of the herring harvest to the fishermen was approximately $3,605,596.65.

Until the June 7 survey, the total harvest as of May 31 was thought to be roughly 18%. It is now apparent that the exploitation rate is considerably less, roughly 16%, based on a biomass of 39,384 st. The younger age classes observed on the June 7 survey were added to the earlier biomass estimate. It would seem likely that the biomass has been significantly underestimated in the past and that survival rates and residence time in near shore waters should be carefully considered in the future.

Fishery Management / Emergency Orders

Aerial survey conditions were predominantly fair to good (Table 14B). The first survey was flown May 15. Pilot reports the evening of May 23 reported small amounts of herring and a survey May 24 confirmed those sightings. Biomass built over the next several days and the biomass threshold of 7000 st was exceeded the morning of May 26. Massive sheets of shore fast ice were covering southern

Norton Sound, the prime spawning area, and Pastol Bay at this time. Test fishing at Unalakleet and Cape Denbigh indicated rapidly ripening fish and warm water temperatures especially near the Cape. A Beach Party was organized for the afternoon of May 27. An aerial survey flown that morning sighted the all time record biomass of 35,521.8 st. The 26 samples examined at the beach party showed mixed ripeness with slightly more "green" fish than spawned and a high proportion of males. Spawning began that afternoon in earnest with the peak day of spawning being recorded as May 28. The first Beach seine and gill net openings were held May 28 in subdistricts 1,2,and 3. Eighty percent of the catch from the Cape Denbigh gill net opening was sold as bait, consequently that portion of subdistrict 3 west of the Shaktoolik River was closed for the next two gill net periods in an attempt to target more valuable sac roe quality herring.

During May 29 and 30, the gill net periods were timed to fish high tides similar to the first period. Beach seine openings were allowed to coincide with gillnet openings in order to allow fishing the incoming tides which seiners prefer for pumping. By the end of the May 29 seine opening, the seine harvest was estimated to be 240 st. Two hours fishing time was allowed for seining on May 30 in order to more closely fill the 330 st harvest guideline.

Several seiners petitioned the Board of Fisheries to strike the portion of the regulation limiting the seine harvest to not more than 10% of the preseason harvest projection. They preferred the regulation to read no more than 10% of the allowable harvest. The Board took up the petition in a teleconferenced meeting and rejected it 4:3. That action closed the beach seine season.

The last gillnet period of the season brought the estimated harvest to 6,400 st. Twelve abandoned gillnets had been seen with an estimated 5 st of herring in each, indicating at least 60 st of waste. There were rumors of up to 200 st of herring harvested inside the shorefast ice in St. Michael Bay that were yet to be reported. At that time the allowable harvest was thought to be 7,000 st. On May 31, roughly 300 square miles of sea ice broke loose and began to drift north and east into the most productive gill net fishing areas. Schools of herring with marketable roe were becoming harder to find, one company had reached capacity and others were turning some fishermen away if their roe quality was below 8.0%. All these factors led to the decision to close the fishery on the evening of May 31. The risk of harvesting low value herring or suffering an ice related loss of harvest outweighed the need to more closely meet the allowable harvest.

Several days of dense ice floes followed the fishery. Then an interval of fog for several more days, delayed the next survey until June 7. A full survey of the district flown over June 7 and 8 sighted 25,576 st. Age data indicates one-sixth of that biomass was young age classes not present 10 days earlier.

On June 12 the last test fish samples were collected and the last aerial survey of the season was flown.

Enforcement

Protection efforts in Norton Sound consisted of three single engine aircraft (2 super cub on wheels, a helicopter and a C-185 on wheels) and several small boats

as well as the P/V Wolstad. Personnel consisted of 8 permanent, full-time Fish and Wildlife Protection officers and three civilian Public Safety employees.

Fish and Wildlife Protection officers patrolled the grounds during each opening and closure. This represents the best enforcement effort ever mounted in the Norton Sound herring fishery. Over 20 citations were issued for the following sorts of violations: fishing closed period (early), fishing closed period (late), fishing more than two shakels of gill net, and fisherman without identification. In addition, investigations are pending on abandoned gill net gear and superexclusive use violations. A total of 23.6 st of herring was confiscated by the State of Alaska during the 1990 season. Additional forfeitures are possible following further investigation.

Research

Two Department field crews were operational during the 1990 season. One crew operated from Cape Denbigh. A second crew operated from Klikitarik, the most frequently used test fish site of southern Norton Sound.

Unalakleet field office personnel during the season consisted of the area management biologist, the assistant area management biologist, the assistant area biologist from Fairbanks, and a FOA catch monitor/public receptionist. In addition, two fisheries technicians were hired to fulfill additional sampling requirements of a stock identification project implemented during 1990 for the Bering Sea herring fisheries. The regional herring biometrician was present to provide overall quality control of herring sampling and assistance with sample collection and procedures as was the regional research coordinator who assisted the staff in nearly every facet of the operation.

1991 Commercial Season Summary

The 1991 total harvest based on fish ticket data was 5671.4 short tons (st) of herring. In addition, approximately 125.0 st were estimated to have been wasted in abandoned gill nets. The total catch is thus 5796.4 st. Since 1981, catches have averaged 4,641 st.

During the 1991 season, 272 fishermen used gill nets, landing a total of 5149.7 st. The average sac roe recovery for gill net caught herring was 9.2%. Seven fishermen participated in the beach seine fishery, landing 521.7 st of herring. The average sac roe recovery for beach seine caught herring was 10.4% (Table 12C and 13C). An effort was made to separate beach seiners from the gill net fleet to prevent gear conflicts and to enable the Department to better monitor the beach seine fishery. The timing of the beach seine fishery was not coincidental with the gill net fishery. One educational gill net permit was issued by CFEC, and fished by the Bering Straits School District Commercial Fisheries Vocational class immediately following the closure of the commercial gill net and beach seine fisheries. A total of 7.6 st was landed on this permit, and is included in the gill net total harvest.

There were eight companies present on the grounds during the season to purchase herring. These 8 companies registered 12 processors and 55 tenders to operate in Norton Sound.

The average sac roe recovery for all gear types was 9.3%. The combined sac roe and bait roe percentage was 9.2% roe due to the 206.7 st bait harvest. Based on final operations reports, it appears the average price advanced for a short ton of 10% roe herring was approximately $458.32. The average price paid to the fishermen for a short ton of 9.3% fish was approximately $421.65. Of the 5671.4 st harvested, 206.7 st were purchased as bait herring (roe % less than 7.0%) for which fishermen received an average of $56.30 per ton. The total value of the herring harvest to the fishermen was approximately $2,413,635.70.

Until the June 4 survey, the total harvest as of May 25 was thought to be roughly 20 percent of the total biomass. It is now apparent that the exploitation rate is considerably less. Indeed, the preseason biomass estimate based on past year's estimated rates of survival is off by 40 percent, as it has been frequently in the past.

Fishery Management / Emergency Orders

Aerial survey conditions were predominantly fair (Table 14C). The first survey was flown May 15. Pilot reports the evening of May 13 reported small amounts of herring. Ice floes interfered with aerial survey efforts until May 21. Predominantly old age herring composed the bulk of the biomass observed near shore through May 27. Ice floes cover the preferred spawning area until May 24, when the ice began to retreat from east to west over the next three days. On May 22 industry spotters reported herring spawning at Egg and Besboro Islands. Water temperatures at the Islands were quite warm in comparison to the normal spawning areas which were still iced in. Samples of herring taken on May 22 and 23 indicated that virtually all the herring in near shore waters were ripe with no "green" or spawned fish. Apparently, cold water associated with the ice was preventing the mature herring from spawning and caused a pooling affect where the biomass accumulated as the herring waited for the water to warm.

The first beach seine opening was held on the evening of May 23. Preliminary reports indicated that opening yielded nearly 400 st of 10.5 percent herring. Because roe quality was good and was unlikely to increase, a gill net opening was scheduled for the evening of May 24. Preliminary reports indicated a gill net harvest of 2000 st with a roe quality of 9.5 percent. Using the harvest rate from the first opening, a second opening was announced to complete the preseason projected harvest. The ice was beginning to dissipate on the spawning grounds and the proportion of spawned fish was expected to rise resulting in poorer roe quality. In the mean time, the beach seiners had agreed to co-op their remaining harvest and on the evening of May 24 a final opening was held for two beach seine crews to harvest 45 st a piece.

Spawning began on May 25 in earnest with the peak day of spawning being recorded as May 27. Over May 27 and 28 the educational permit was allowed to fish near Unalakleet. Catch rates during the educational permit fishery were slow indicating the bulk of the spawners had already made their way south. On May 27,

large amounts of herring were seen on the spawning grounds. Even with those observations, sufficient biomass to hold a third gill net opening could not be documented. Surveys on June 28 and 29 did not change that assessment. Poor weather did not allow another survey until June 3, only at that time did it become evident that the biomass was appreciably larger than the preseason projection. The final Norton Sound survey was flown June 7.

On June 13 the last test fish samples were collected and the last aerial survey of the season was flown.

Enforcement

Protection efforts in Norton Sound consisted of three single engine aircraft (a super cub on wheels, a helicopter and a C-185 on wheels) and several small boats as well as the P/V Wolstad. Personnel consisted of 8 permanent, full-time Fish and Wildlife Protection officers and four civilian Public Safety employees.

Fish and Wildlife Protection officers patrolled the grounds during each opening and closure. This represents one of the best enforcement efforts ever mounted in the Norton Sound herring fishery. Thirty citations were issued for the following sorts of violations: fishing closed period (early), fishing closed period (late), abandon nets, vessel registration, and assault. In addition, investigations are pending on abandoned gill net gear and superexclusive use violations. A total of 21.3 st at 7.9% of herring was confiscated by the State of Alaska during the 1991 season. Additional forfeitures are possible following further investigation.

Research

Two Department field crews operated during the 1991 season. One crew operated from Cape Denbigh and the second crew operated from Klikitarik.

Unalakleet field office personnel during the season consisted of the area management biologist, the Norton Sound and Dillingham assistant area management biologists, the FOA/catch monitor and a catch monitor/public receptionist. In addition, three fisheries technicians and a biologist were hired to fulfill additional sampling requirements of a stock identification project implemented during 1991 for the Bering Sea herring fisheries. The regional herring biometrician was present to provide overall quality control of herring sampling and assistance with sample collection and procedures as was the regional supervisor who assisted the staff in nearly every facet of the operation.

1992 Outlook

The herring biomass has gradually increased in Norton Sound since 1981, with a recent three year average of 34,100 st. During 1991, the biomass was estimated to be 42,854 st. Projections from 1991 postseason escapement estimates using a schedule of increasing natural mortality with age indicate a returning biomass in 1992 of approximately 26,000 st. Since methods to reliably estimate

recruitment have not been developed, returns of ages 3 through 5-year-old herring could increase the 1992 observed biomass over the projected biomass estimates. The 1992 spawning population is expected to be dominated by age 6, 9, and 10 year old herring (Figure 12).

Department personnel will be conducting aerial surveys and sampling age class composition in-season to obtain current year biomass information. Since methods to reliably forecast herring returns are still being developed, and estimates of recruitment are not available, in-season assessment of biomass will supersede projected biomass for management of the Norton Sound herring fishery. Exceptions are where weather prevents obtaining an in-season estimate, and in the beach seine fishery which is set by regulation at 10% of the projected biomass. Harvest should approach 5,200 st (4,680 st by gill nets, 520 st by beach seines). The Norton Sound District herring biomass will be harvested at a 20% exploitation rate if in-season aerial biomass surveys and age class composition information indicate the run will achieve at least the preseason projected level (26,000 st). If the run does not materialize as projected, the harvest exploitation rate may be reduced from the maximum level.

The fishery will be opened by emergency order. Fishing periods will initially be established to occur simultaneously between subdistricts 1, 2 and 3. The more northerly subdistricts may be opened at some later time if herring are judged to be in sufficient quantity and of good roe quality. Subdistricts may be closed independently of each other to prevent overharvest if herring biomass distribution and harvest rates make such action necessary. Beach seine fishing periods may be reduced in length, and may be established separately from gill net fishing periods to provide the Department the opportunity to closely monitor the harvest rate and gain accurate catch reports. This management technique may additionally increase the duration of the beach seine fishery so it occurs over approximately the same length of time as the gill net fishery.

Table 12A. Herring harvest and effort by date and subdistrict, Norton Sound District, all gear types combined, 1989.

	Subdistrict 1 Canal Point-Spruce Creek			Subdistrict 2 Spruce Creek-Junction Creek			Subdistrict 3 Junction Creek-Island Point			District Totals		
Date	Number Fishermen	Daily Catch(st)	Daily Roe%[a]	Number Fishermen	Daily Catch(st)	Daily Roe%[a]	Number Fishermen	Daily Catch(st)	Daily Roe%[a]	Number Fishermen	Daily Catch(st)	Daily Roe%[a]
5/27	198	1,069.7	8.7	1	50.0	10.1	52	464.5	8.7	251	1,584.2	8.7
5/28	209	1,215.2	9.6	0	-	-	82	780.3	9.8	291	1,995.5	9.7
5/29	212	819.4	9.3	0	-	-	70	179.7	9.2	282	999.1	9.3
5/30	5	152.0	8.1	1[b]	6.8	7.5	0	-	-	6	158.8	8.1
5/31	0	-	-	1[b]	3.5	9.8	0	-	-	1	3.5	9.8
Totals	275	3,256.3[c]	9.2	2	60.3	9.8	97	1,424.5[d]	9.4	357	4,741.0[e,f,g]	9.2

[a] Daily roe% does not include fish bought as bait.
[b] Educational permit of Bering Straits School District.
[c] Includes a harvest of 228.0 st of bait herring (roe % = 5.1).
[d] Includes a harvest of 19.4 st of bait herring (roe % = 5.7).
[e] Includes a harvest of 247.3 st of bait herring (roe % = 5.2).
[f] Includes 26.0 st confiscated by the Alaska Department of Public Safety and the educational permit harvest of 10.3 st.
[g] Does not include an estimated wastage of 30.0 st in abandoned gill nets and a lost beach seine set.

Table 12B. Herring harvest and effort by date and subdistrict, Norton Sound District, all gear types combined, 1990.

Date	Subdistrict 1 Canal Point-Spruce Creek			Subdistrict 2 Spruce Creek-Junction Creek			Subdistrict 3 Junction Creek-Island Point			District Totals		
	Number Fishermen	Daily Catch(st)	Daily Roe%[a]	Number Fishermen	Daily Catch(st)	Daily Roe%[a]	Number Fishermen	Daily Catch(st)	Daily Roe%[a]	Number Fishermen	Daily Catch(st)	Daily Roe%[a]
5/28	166	1,158.2	8.7	22	167.6	9.8	102	625.9	8.7	275	1,951.7	8.8
5/29	254	1,980.8	8.6	21	177.4	8.8	3	41.1	10.0	265	2,199.2	8.7
5/30	92	660.0	7.8	116	582.0	9.4	27	50.7	9.0	233	1,292.7	8.6
5/31	140	698.7	9.0	30	23.3[b]	9.6	60	213.8	9.0	229	935.8	9.0
Totals	316	4,497.7[c]	8.6	147	950.2	9.4[d]	121	931.5[e]	9.0	365	6,379.4[f,g]	8.8

[a] Daily roe% does not include fish bought as bait.
[b] Educational permit of Bering Straits School District (totaling 8.5 st @ 8.4%; 2.3st @ 6.8% on 6/1 and 6.2 st @ 9.0% on 6/5).
[c] Includes a harvest of 692.9 st of bait herring (roe % = 5.4).
[d] Includes a harvest fo 44.1 st of bait herring (roe % = 4.9).
[e] Includes a harvest of 289.1 st of bait herring (roe % = 5.3).
[f] Includes 23.6 st confiscated by the Alaska Department of Public Safety and the educational permit harvest of 8.5 st.
[g] Does not include an estimated wastage of 60.0 st in abandoned gill nets .

Table 12C. Herring harvest and effort by date and subdistrict, Norton Sound District, all gear types combined, 1991.

Date	Subdistrict 2 Spruce Creek-Junction Creek			Subdistrict 3 Junction Creek-Island Point			District Totals		
	Number Fishermen	Daily Catch(st)	Daily Roe%	Number Fishermen	Daily Catch(st)	Daily Roe%	Number Fishermen	Daily Catch(st)	Daily Roe%
5/23	4	118.2	10.4	3	251.3	10.3	7	369.5	10.4
5/24	76	509.8	7.7	152	1,472.8	8.9	228	1,982.6	8.6
5/25	41	243.9	9.4	225	3,067.9	9.3	266	3,311.8	9.3
5/27-28	1	7.6 1/	10.7				1	7.6	10.7
Totals	100	879.5 2/	8.6	237	4,792.0 3/	9.2	279	5,671.5 4/5/	9.1

1/ Educational permit of Bering Straits School District (totaling 7.6 st @ 10.7%; 4.3st @ 10.0% on 5/27 and 3.3 st @ 11.7% on 5/28).
2/ Includes a harvest of 81.7 st of bait herring (roe % = 5.8).
3/ Includes a harvest of 125.0 st of bait herring (roe % = 6.1).
4/ Includes 21.3 st confiscated by the Alaska Department of Public Safety and the educational permit harvest of 7.6 st.
5/ Does not include an estimated wastage of 125.0 st in abandoned gill nets .

Table 13A. Norton Sound herring harvest by subdistrict by gear type, 1989.

		Gill Net[a]				Beach Seine[a]				Totals			
Stat Area	Location	Sac Roe (st)	Avg. Roe %	Bait (st)	# fm	Sac Roe (st)	Avg. Roe %	Bait (st)	# fm	Sac Roe (st)	Avg. Roe %	Bait (st)	# fm
333-70	Canal Point-Spruce Creek	2,699.2	9.3	228.0	270	329.1	8.2	-	6	3,028.3	9.2	228.0	275
333-72	Spruce Creek-Junction Creek	10.3	8.3	-	1[b]	50.0	10.1	-	1	60.3	9.8	-	2
333-74	Junction Creek-Island Point	1,394.5	9.4	19.4	95	10.6	9.6	-	2	1,405.1	9.4	19.4	97
Totals		4,104.0	9.3	247.4	351[d]	389.7	8.5	-	6[d]	4,493.7[c]	9.2	247.3	357[d]

[a] Gill net openings: 5/27 11am-3pm - 4 hours; 5/28 11am-3pm - 4 hours; 5/29 11am-1pm - 2 hours; 10 hours

Beach Seine openings: 5/27 6pm-9pm - 3 hours; 5/28 6pm-9pm - 3 hours; 5/29 4pm-9pm - 5 hours; 5/30 11am-2pm- 3 hours; 14 hours

[b] Educational gill net permit.
[c] Includes 26.0 st of sac roe herring confiscated by the Alaska Department of Public Safety; does not include an estimated 30.0 st of wastage.
[d] Number of permits fished.

Table 13B. Norton Sound herring harvest by subdistrict by gear type, 1990.

		Gill Net[a]				Beach Seine[a]				Totals			
Stat Area	Location	Sac Roe (st)	Avg. Roe%	Bait (st)	# fm	Sac Roe (st)	Roe%	Bait (st)	# fm	Sac Roe (st)	Roe%	Bait (st)	# fm
333-70	Canal Point-Spruce Creek	3,798.6	8.6	692.8	314	6.2	7.6	0.1	2	3,804.8	8.6	692.9	316
333-72	Spruce Creek-Junction Creek	573.8	9.2	44.1	142[b]	332.3	9.6	-	5	906.1	9.4	44.1	147
333-74	Junction Creek-Island Point	636.0	8.8	286.9	119	6.4	6.9	2.3	2	642.4	8.8	289.2	121
Totals		5,008.4	8.7	1,023.8	357[d]	344.8	9.5	2.4	8[d]	5,353.3[c]	8.8	1,026.1[d]	365

[a] Gill net openings: 5/28 9am-1pm - 4 hours; 5/29 8am-5pm - 9 hours; 5/30 9am-1pm - 4 hours; 5/31 Noon-2pm - 2 hours; 19 hours

Beach Seine openings: 5/28 4pm-7pm - 3 hours; 5/29 3pm-6pm - 3 hours; 5/30 10pm-Noon - 2 hours; 8 hours

[b] Educational gill net permit included.

[c] Includes 23.6 st of sac roe herring confiscated by the Alaska Department of Public Safety; does not include an estimated 60.0 st of wastage.

[d] Number of permits fished.

Table 13C. Norton Sound herring harvest by subdistrict by gear type, 1991.

		Gill Net 1/				Beach Seine 1/				Totals			
Stat Area	Location	Sac Roe (st)	Avg. Roe %	Bait (st)	# fm	Sac Roe (st)	Avg. Roe %	Bait (st)	# fm	Sac Roe (st)	Avg. Roe %	Bait (st)	# fm
333-72	Spruce Creek-Junction Creek	649.1	8.5	81.7	94 2/	148.6	10.4	-	4	797.7	8.8	81.7	100
333-74	Junction Creek-Island Point	4,293.9	9.3	125.0	232	373.1	10.4	-	3	4,667.0	9.4	125.0	237
Totals		4,943.0	9.2	206.7	4/ 272	521.7	10.4	0	4/ 7	3/ 5,464.7	9.3	206.7	4/ 279

1/ Gill net openings: 5/24 5pm-9pm - 4 hours
5/25 11am-6pm - 7 hours
5/27-28 Educational openings - 15 hours
11 hours

Beach Seine openings: 5/23 1:30pm-3:30pm - 2 hours
5/25 9pm-11pm - 2 hours
4 hours

2/ Educational gill net permit included.

3/ Includes 21.3 st of sac roe herring confiscated by the Alaska Department of Public Safety; does not include an estimated 125.0 st of wastage.

4/ Number of permits fished.

Table 14A. Daily observed peak biomass estimates of Pacific herring, Norton Sound District, 1989.

Date	Flight No.	Observer Initials	Survey		Spawn		Estimated Biomass(st) By Index Area[c]							
			Hours	Rating[b]	No.	Length(mi)	KLK	UNK	CDB	NTB	ELM	GOL	NOM	TOTAL
05/16	1	C.L.		5	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05/23	2	S.M.	0.9	5	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05/24	3	S.M	1.5	5	8	0.8	53.2	0.0	0.0	0.0	0.0	0.0	0.0	53.2
05/25	4	C.L	2.4	3	101	14.3	2,547.0	0.0	1,821.6	0.0	0.0	0.0	0.0	4,368.6
05/26	5	C.L.	2.3	3.5	52	19.3	2,160.0	169.0	2,674.2	0.0	0.0	0.0	0.0	5,003.2
05/26	6	S.M.	2.6	4	33	5.0	1,835.4	15.2	274.6	0.0	0.0	0.0	0.0	2,125.2
05/27	7	C.L.	2.7	3	31	5.2	2,996.8	797.0	1,650.3	0.0	0.0	0.0	0.0	5,444.1
05/27	8	C.L.	2.7	4.5	26	5.8	4,918.4	238.9	1,738.3	0.0	0.0	0.0	0.0	6,895.6
05/28	9	C.L.	2.8	4.8	41	2.7	1,226.0	84.8	93.9	0.0	0.0	0.0	0.0	1,404.7
05/29	10	C.L.	3.4	5	34	2.8	378.0	0.0	396.0	0.0	0.0	0.0	0.0	774.0
05/29	11	S.M.	2.2	4.8	4	0.5	432.7	0.0	0.0	0.0	0.0	0.0	0.0	432.7
05/30	12	C.L.	1.8	5	14	0.9	634.4	0.0	0.0	0.0	0.0	0.0	0.0	634.4
05/31	13	C.L.	2.9	5	57	1.6	5,692.2	0.0	629.8	0.0	0.0	0.0	0.0	6,322.0
06/01	14	C.L.	2.5	5	38	2.5	1,956.0	53.2	229.7	0.0	0.0	0.0	0.0	2,238.9
06/02	15	C.L.	4.6	5	32	1.6	15,310.3	1,720.6	2,053.8	0.0	0.0	0.0	0.0	19,084.7[a]
06/05	16	C.L.	5.0	5	9	0.5	0.0	0.0	0.0	0.0	248.7	0.0	0.0	248.7
06/07	17	C.L.	4.6	4	0	0.0	941.9	1,288.0	12,543.3	0.0	0.0	0.0	0.0	14,773.2
Totals			44.9	5	480	63.5								23,856.7[a]

[a] Peak observed biomass; adding the cumulative harvest prior to this survey indicated a peak biomass of 23,856.7 st.
[b] Survey ratings: 1=excellent 2=good 3=fair 4=poor 5=unacceptable
[c] KLK = s.d.1 CDB = s.d.3 ELM = s.d.5 NOM = s.d.7
UNK = s.d.2 NTB = s.d.4 GOL = s.d.6

Table 14B. Daily observed peak biomass estimates of Pacific herring, Norton Sound District, 1990.[a]

Date	Flight No.	Observer Initials	Survey		Spawn		Estimated Biomass (ST) By Index Area[c]							
			Hours	Rating[b]	No.	Length (mi)	KLK	UNK	CDB	NTB	ELM	GOL	NOM	TOTAL
5/15	1	C.L	1.8	ice	0	0.0								0.0
5/16	2	F.B.	0.9	ice	0	0.0								0.0
5/18	3	F.B.	1.8	ice	0	0.0								0.0
5/21	4	C.L.	0.8	ice	0	0.0								0.0
5/22	5	C.L.	2.0	3	0	0.0								0.0
5/23	6	F.B.	1.5	3										0.0
5/24	7	C.L.	2.1	2			28.9	21.3	290.8					341.0
5/25	8	R.H./F.B.	1.5	3	1	0.1	28.9	59.3	98.8					187.0
5/25	9	C.L./F.B.	2.5	2	1	0.0	715.3	371.4	971.2					2057.9
5/26	10	C.L./F.B.	2.8	1	88	8.3	1419.6	5445.9	5350.2					12215.7
5/26	11	C.L./R.H.	2.1	3	33	5.8	1468.3	1890.7	7095.1					10454.1
5/27	12	C.L./R.H.	2.8	3	22	1.8	17870.2	1201.5	16450.1					35521.8[a]
5/27	13	C.L./F.B.	2.0	4	24	8.2	4054.7	2200.0	3324.5					9579.2
5/28	14	C.L./F.B.	3.0	4	39	23.3	640.9	6095.2	1810.0					8546.1
5/29	15	C.L./R.H.	2.5	3	3	0.0				429.6	1064.8	463.6	0.0	1958.0
5/30	16	C.L./J.B.	2.8	4	10	19.6	5020.0	2161.8	765.1					7946.9
5/30	17	F.B.	1.1	3	44	5.0	1835.0	136.8						1971.8
5/31	18	F.B.	3.1	3	15	2.2		402.8	3863.8	646.3	1889.5	538.5		7340.9
5/31	19	C.L.	1.4	4	21	14.2	1556.8	0.0						1556.8
6/4	20	C.L.	2.1	2	0	0.0							capelin	0.0
6/7	21	C.L.	3.4	3	1	0.0		7942.6	4611.5	2253.9	3739.0	4643.7	838.5	24029.2
6/8	22	C.L.	1.5	4	17	1.5	1501.7	45.6						1547.3
6/12	23	C.L./F.B.	2.1	3	0	0.0							132.8	132.8
Total			47.6	2	319	90.0					Estimated Peak Biomass			35521.8

[a] Norton Sound District peak biomass.

[b] Rating 1=excellent 2=good 3=fair 4=poor 5=unacceptable

[c] Index Areas: KLK = s.d.1 NTB = s.d.4 NOM = s.d.7
UNK = s.d.2 ELM = s.d.5
CDB = s.d.3 GOL = s.d.6

Table 14C. Daily observed peak biomass estimates of Pacific herring, Norton Sound District, 1991.

Date	Flight No.	Observer Initials	Survey Hours	Survey Rating	Spawn No.	Spawn Length (mi)	Estimated Biomass (ST) By Index Area KLK	UNK	CDB	NTB	ELM	GOL	NOM	TOTAL
5/8	1	FB	3.1	ice	0	0.0								0.0
5/15	2	FB/CL	1.4	ice	0	0.0								0.0
5/17	3	CL	1.0	ice	0	0.0								0.0
5/18	4	CL	0.6	ice	0	0.0								0.0
5/20	5	FB	1.4	ice	0	0.0								0.0
5/21	6	CL	3.0	3	0	0.0	0.0	395.6	0.0	0.0	324.0			719.6
5/22	7	FB/CL	3.0	3	9	0.3	5.2	1385.6	1223.7	0.0	212.0			2826.5
5/22e	8	CL	2.0	4	0	0.0	687.6	992.4	784.3					2464.3
5/23	9	CL/TB	3.0	3	3	0.2	0.0	3889.2	4289.0	0.0	289.4	457.1		8924.7
5/24	10	CL/FB	2.0	3	0	0.0	0.0	2645.8	4888.0					7533.8
5/24	11	FB/TB	1.3	3	0	0.0	0.0	1893.3	512.6					2405.9
5/25	12	CL	3.5	4	38	3.3	318.2	10485.1	7080.8					17884.1
5/26	13	CL	2.5	5	26	2.1	890.5	7.6	0.0					898.1
5/27	14	CL/FB	3.5	4	62	10.8	12995.5	3895.7	4754.3	0.0	0.0			21645.5
5/28	15	CL/FB	3.5	3	50	7.9	7387.8	4359.9	5577.8	0.0	7.7	0.0		17333.2
5/29	16	CL	5.0	4	7	1.7	51.6	183.2	5870.5	0.0	0.0	440.6	358.6	6904.5
6/03	17	FB/CL	4.2	3	28	2.3	4759.2	1014.7	12924.3	2108.1	697.3	979.2	4155.0	26637.8
6/4	18	FB/CL	4.5	3	27	1.5	7112.3	218.2	5975.2	1724.1	6868.6	529.2	3634.2	26061.8
6/07	19	FB	3.8	3	4	0.1	2376.1	123.4	1916.5	680.2	13296.3	2969.0	5568.0	26929.5
6/10	20	FB/CL	3.6	4									46.4	46.4
							Peak Biomass (st) by Index Area							
Sum	-		55.9	3	254	30.2	12995.5	4359.9	5975.2	1724.1	6868.6	979.2	4155.0	37057.5
									Waste	125.0	Harvest	5671.4	Tot.Harv.	5796.4
													Biomass	42853.9
									Exploit%	13.52%				

Rating 1=excellent 2=good 3=fair 4=poor 5=unacceptable

Index Areas: KLK = s.d.1 NTB = s.d.4 NOM = s.d.7
UNK = s.d.2 ELM = s.d.5
CDB = s.d.3 GOL = s.d.6

Table 15A. Norton Sound herring spawn estimates by subdistrict (s.d.), 1989.

Date	s.d. 1		s.d. 2		s.d. 3		s.d. 4		s.d. 5		s.d. 6		s.d. 7		Total	
	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles
5/16	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/23	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/24	8	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	8	0.5
5/25	101	14.3	0	0.0	5	0.1	0	0.0	0	0.0	0	0.0	0	0.0	106	14.4
5/26	49	18.5	0	0.0	3	0.8	0	0.0	0	0.0	0	0.0	0	0.0	52	19.3
5/26	32	5.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	33	5.0
5/27	27	4.6	0	0.0	4	0.6	0	0.0	0	0.0	0	0.0	0	0.0	31	5.2
5/27	19	3.7	0	0.0	7	2.1	0	0.0	0	0.0	0	0.0	0	0.0	26	5.8
5/28	41	2.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	41	2.7
5/29	34	2.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	34	2.8
5/29	4	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.5
5/30	14	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	14	0.9
5/31	56	1.2	0	0.0	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	57	1.6
6/1	37	1.7	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	38	2.5
6/2	24	0.8	0	0.0	8	0.8	0	0.0	0	0.0	0	0.0	0	0.0	32	1.6
6/5	7	0.4	0	0.0	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	9	0.5
6/7	6	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	0.5
Totals	459	58.1	0	0.0	30	5.6	0	0.0	2	0.1	0	0.0	0	0.0	491	63.8

Table 15B. Norton Sound herring spawn estimates by subdistrict (s.d.), 1990.

Date	s.d. 1		s.d. 2		s.d. 3		s.d. 4		s.d. 5		s.d. 6		s.d. 7		Total	
	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles
5/15	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/16	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/18	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/21	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/22	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/23	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/24	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/25	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1
5/25	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
5/26	83	8.1	0	0.0	5	0.2	0	0.0	0	0.0	0	0.0	0	0.0	88	8.3
5/26	26	4.2	0	0.0	7	1.6	0	0.0	0	0.0	0	0.0	0	0.0	33	5.8
5/27	14	1.0	0	0.0	8	0.8	0	0.0	0	0.0	0	0.0	0	0.0	22	1.8
5/27	19	5.2	0	0.0	5	3.0	0	0.0	0	0.0	0	0.0	0	0.0	24	8.2
5/28	31	19.7	0	0.0	8	3.6	0	0.0	0	0.0	0	0.0	0	0.0	39	23.3
5/29	0	0.0	0	0.0	0	0.0	0	0.0	3	0.0	0	0.0	0	0.0	3	0.0
5/30	9	19.2	0	0.0	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	10	19.6
5/30	44	5.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	44	5.0
5/31	0	0.0	0	0.0	6	0.6	0	0.0	0	0.0	5	1.3	4	0.3	15	2.2
5/31	21	14.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	21	14.2
6/4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
6/7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0
6/8	17	1.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	17	1.5
6/12	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals	265	78.1	0	0.0	41	10.3	0	0.0	3	0.0	5	1.3	5	0.3	319	90.0

Table 15C. Norton Sound herring spawn estimates by subdistrict (s.d.), 1991.

Date	s.d. 1		s.d. 2		s.d. 3		s.d. 4		s.d. 5		s.d. 6		s.d. 7		Total	
	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles	#	miles
5/8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/15	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/18	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/20	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/21	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/22	0	0.0	9	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	0.3
5/22	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/23	0	0.0	3	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.2
5/24	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/24	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5/25	36	2.7	0	0.0	2	0.6	0	0.0	0	0.0	0	0.0	0	0.0	38	3.3
5/26	26	2.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	26	2.1
5/27	60	10.0	0	0.0	2	0.8	0	0.0	0	0.0	0	0.0	0	0.0	62	10.8
5/28	39	5.9	0	0.0	10	1.8	0	0.0	0	0.0	1	0.2	0	0.0	50	7.9
5/29	5	1.5	0	0.0	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0	7	1.7
6/3	28	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	28	2.3
6/4	27	1.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	27	1.5
6/7	3	0.1	0	0.0	1	<0.1	0	0.0	0	0.0	0	0.0	0	0.0	4	0.1
6/10	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals	224	26.1	12	0.5	17	3.4	0	0.0	0	0.0	1	0.2	0	0.0	254	30.2

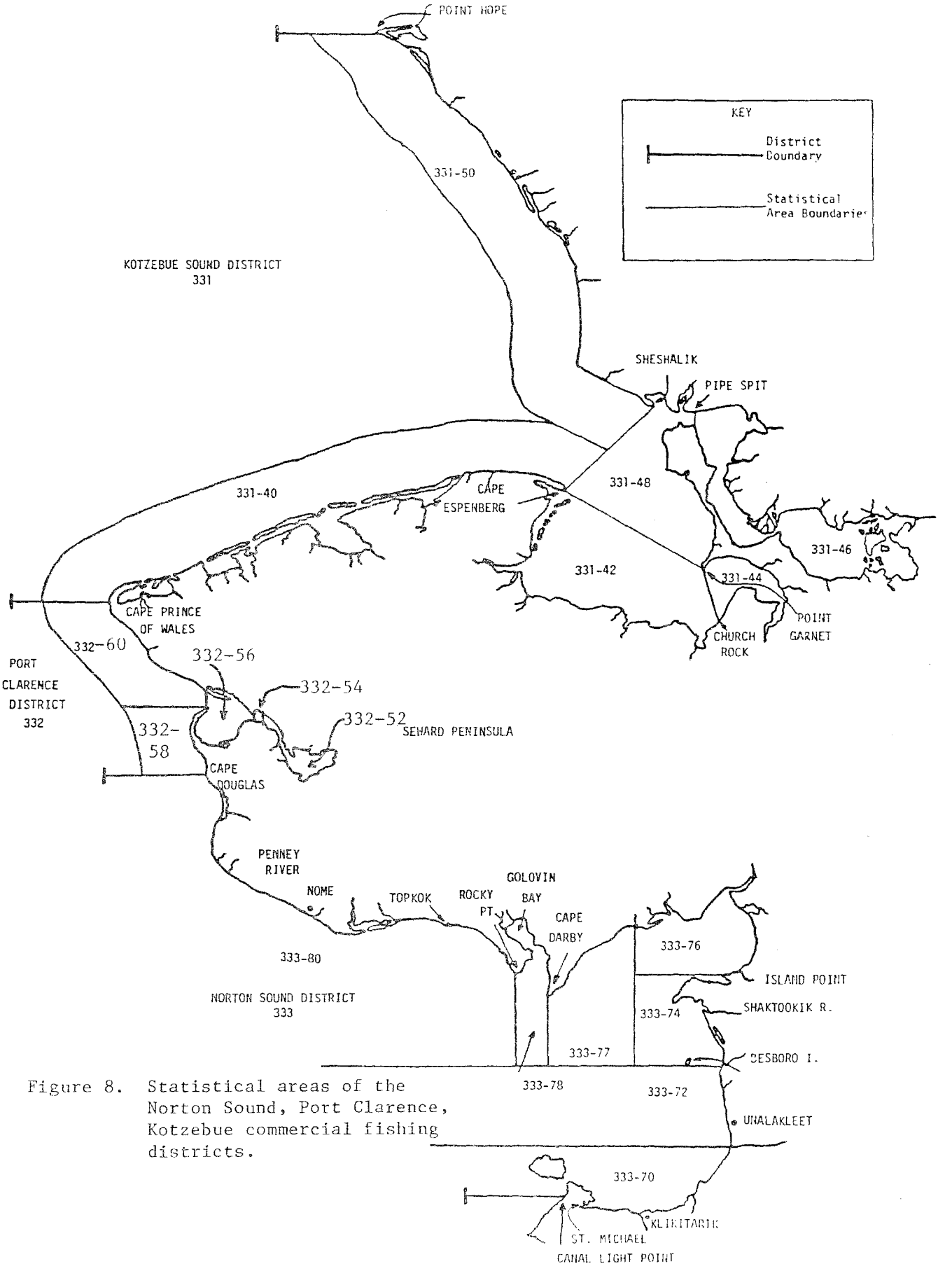


Figure 8. Statistical areas of the Norton Sound, Port Clarence, Kotzebue commercial fishing districts.

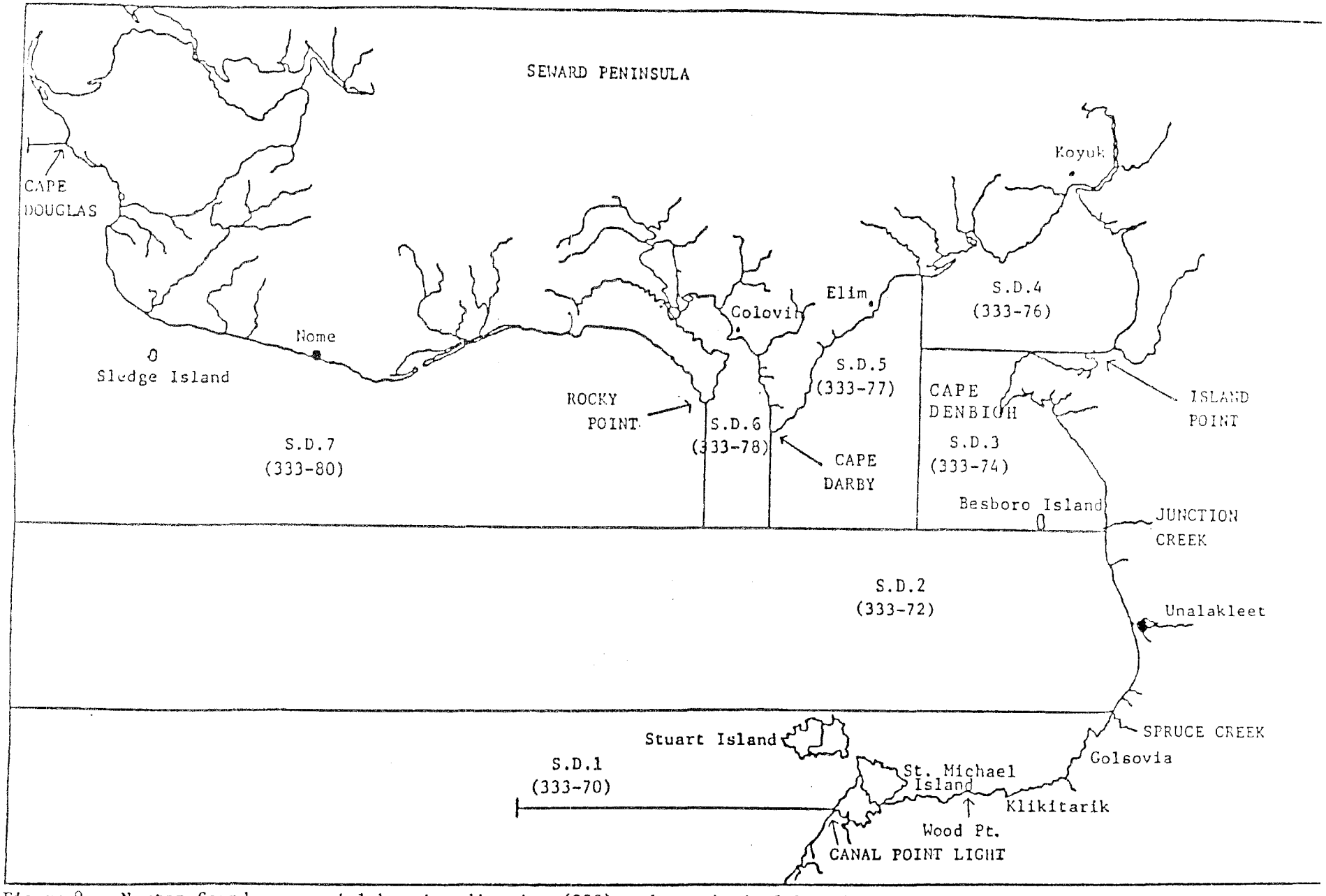


Figure 9. Norton Sound commercial herring district (333) and statistical boundaries.

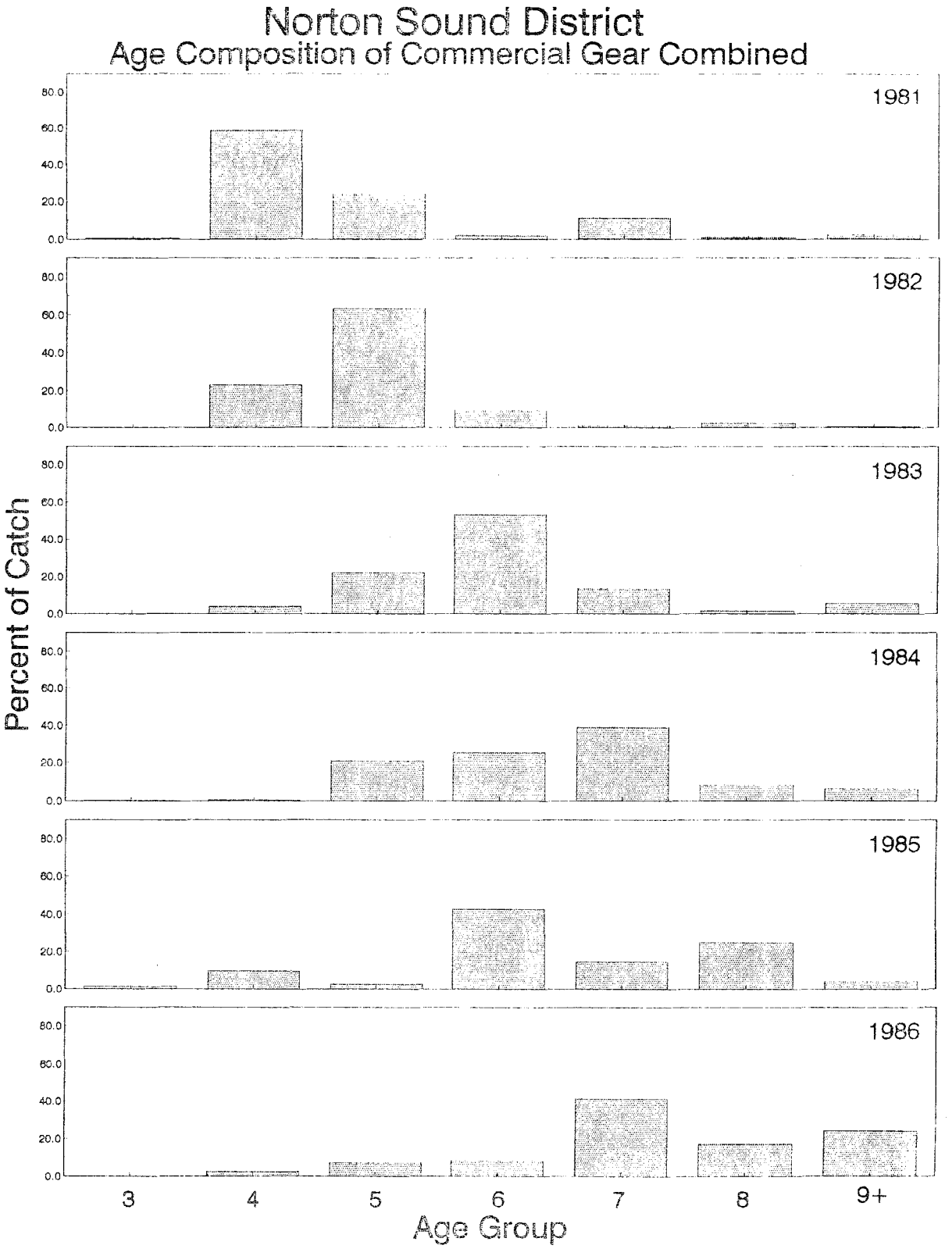


Figure 10. Norton Sound herring age class composition by percentage of commercial catch, commercial gear combined (beach seine and gill nets), 1981-1990.

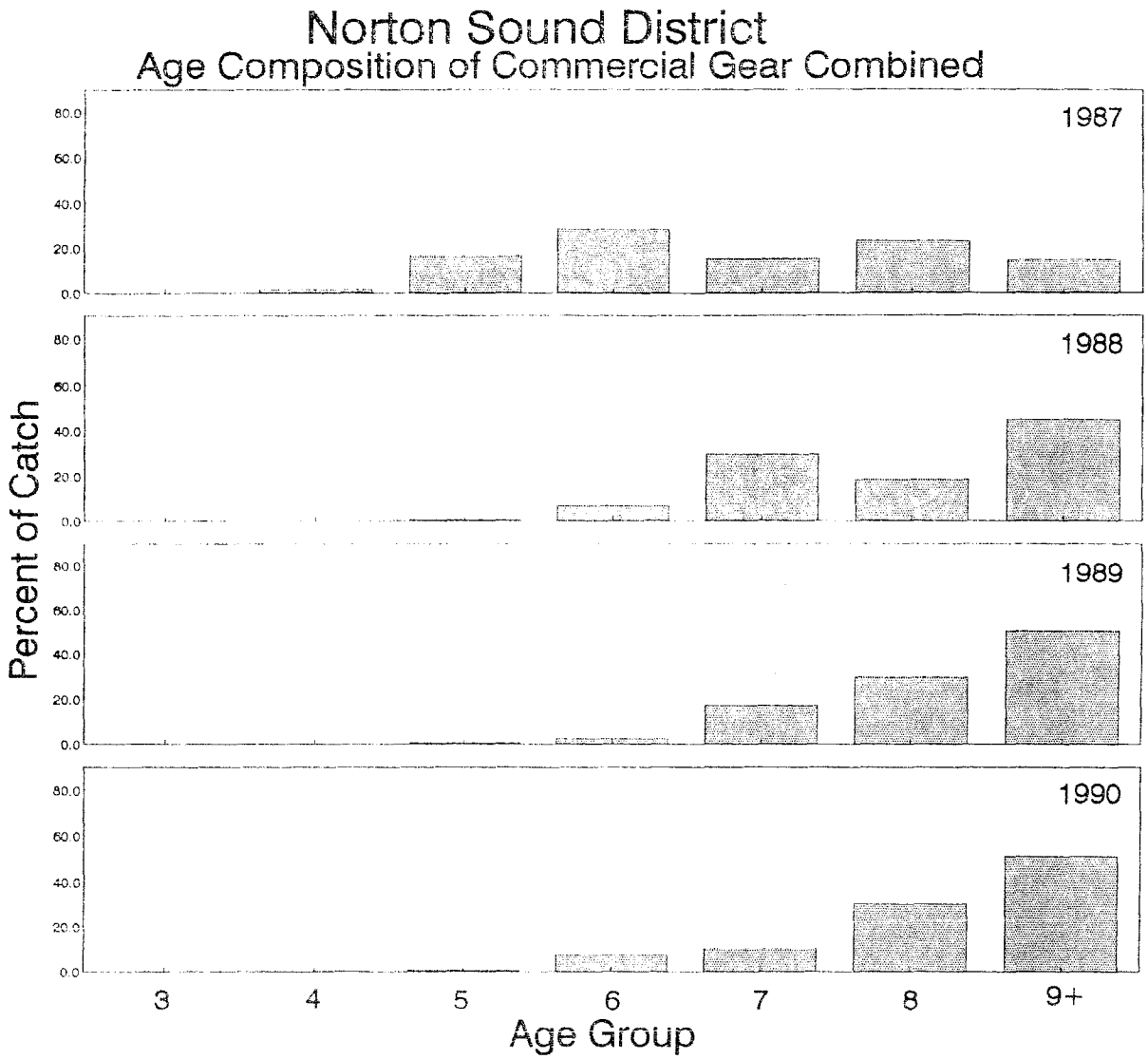


Figure 10. (page 2 of 2)

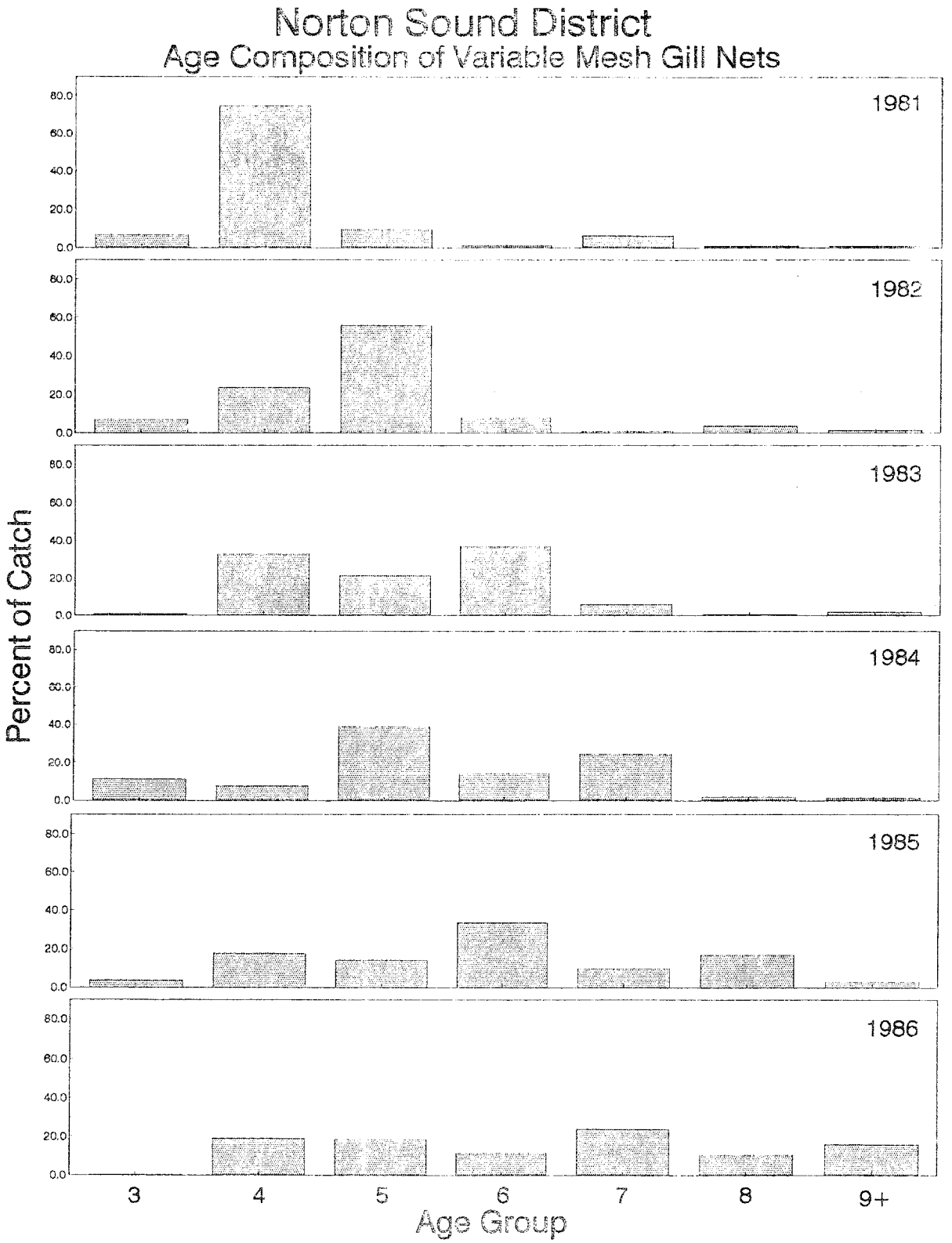


Figure 11. Norton Sound herring age class composition by percentage of total catch, variable mesh gill nets, 1981-1990.

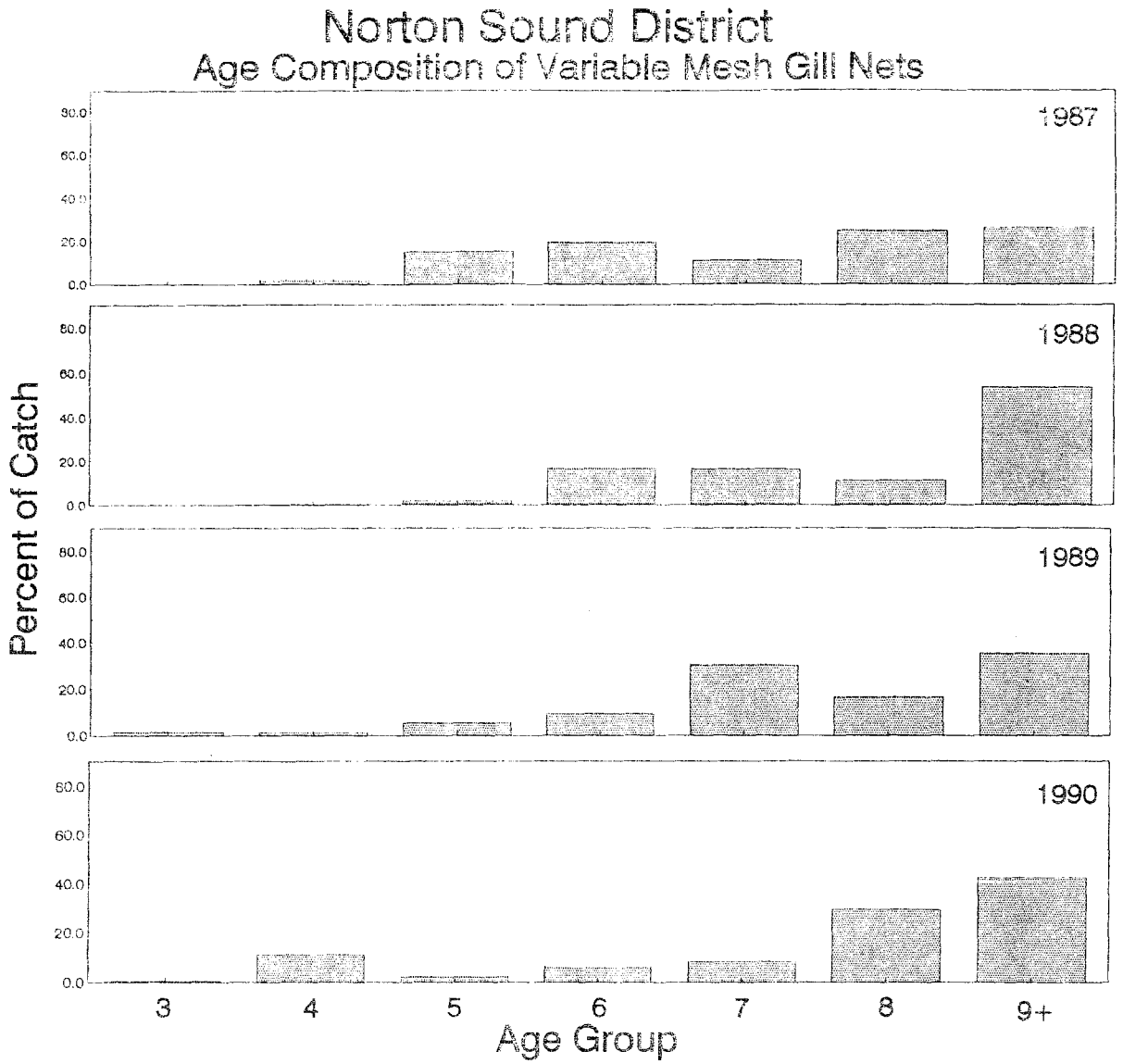


Figure 11. (page 2 of 2)

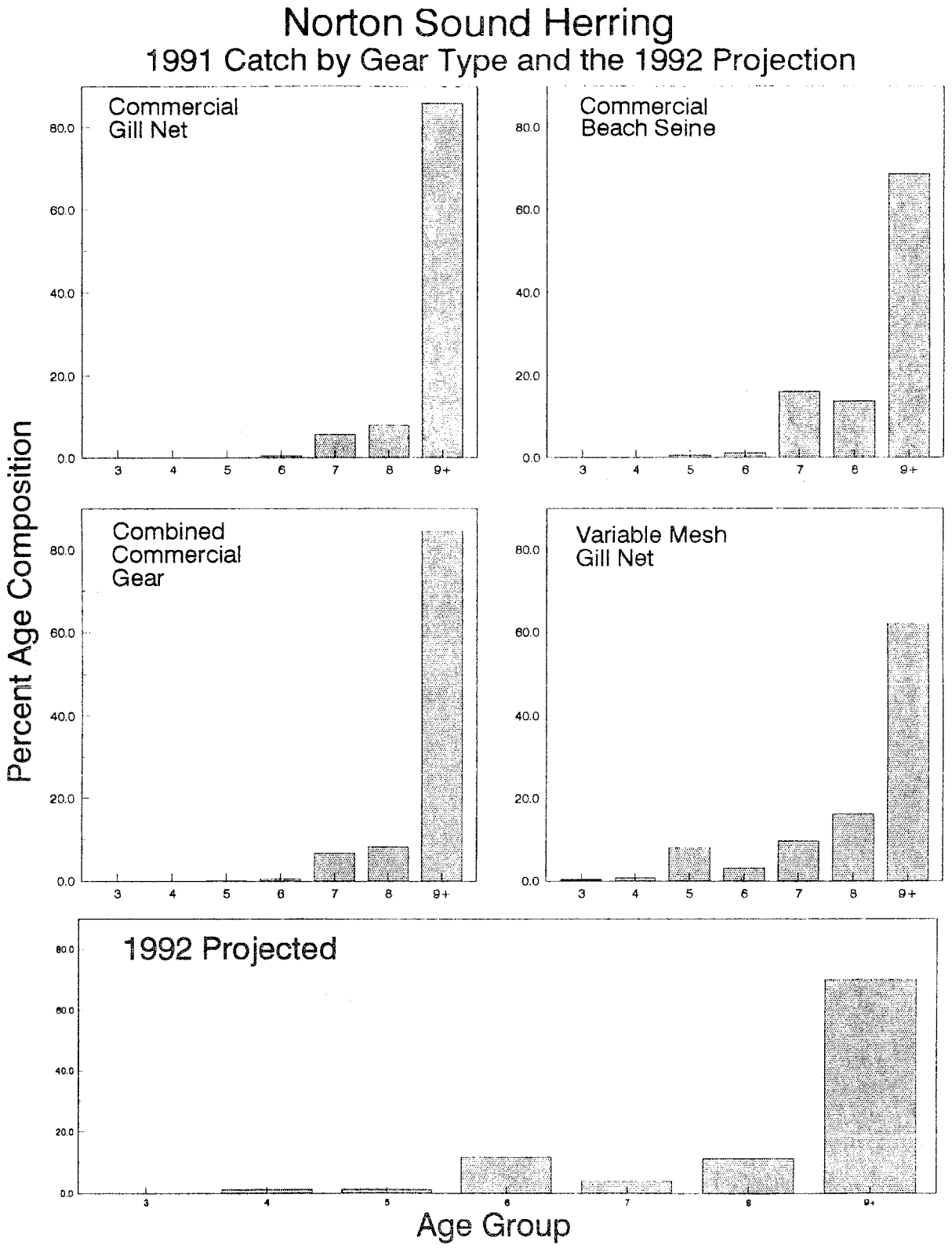


Figure 12. Norton Sound Pacific herring age composition comparison by gear type of capture, 1991, and the projected age composition of the 1992 return.

Appendix Table D1. Norton Sound herring and spawn-on-kelp harvests (in short tons) by U.S. commercial fishermen, 1909-1991.

Year	Sac Roe Herring	Food or Bait Herring	Total	Spawn-on-kelp
1909-1916[a]	-	-	-	-
1916-1928	-	1881	1881	-
1929	-	166	166	-
1930	-	441	441	-
1931	-	86	86	-
1932	-	529	529	-
1933	-	31	31	-
1934	-	4	4	-
1935	-	15	15	-
1936	-	-	-	-
1937	-	6	6	-
1938	-	10	10	-
1939	-	6	6	-
1940	-	14	14	-
1941	-	3	3	-
1942-1963	-	-	-	-
1964	20	-	20	-
1965	-	-	-	-
1966	12	-	12	-
1967	-	-	-	-
1968	-	-	-	-
1969	2	-	2	-
1970	8	-	8	-
1971	20	-	20	-
1972	17	-	17	-
1973	35	-	35	-
1974	2	-	2	-
1975	-	-	-	-
1976	9	-	9	-
1977	11	-	11	trace
1978	15	-	15	4
1979	1292	-	1292	13
1980	2451	1	2452	24
1981	4371	-	4371	47[b]
1982	3864	69	3933	38
1983	4181	401	4582	29[c]
1984	3298	274	3662	19[d]
1985	3420	128	3548	-[e]
1986	4926	268	5194	-
1987	3779	303	4082	-
1988	4256	416	4672	-
1989	4494	247	4743	-
1990	5337	1036	6373	-
1991	5465	207	5671	-

[a] Fishery occurred some years, but harvest unavailable. Fishery from 1909-1941 occurred near Golovin; 1964 to present has occurred in southeast Norton Sound.
[b] Does not include approximately 6 st of wastage.
[c] Does not include approximately 2 st of wastage.
[d] Includes 3 st of spawn on Macrocystus kelp.
[e] All spawn-on-kelp fisheries closed by regulation prior to the 1985 season.

Appendix Table D2. Japanese gillnet herring catches in Norton Sound, 1968-1977. (North of 63 N. Latitude and East of 167 W. Longitude)

Year	Gillnet Catch (st)	Remarks
1968	131	First foreign effort on herring in Norton Sound
1969	1400	Peak catch with large effort (about 40 ships). Two vessels apprehended.
1970	69	
1971	703	
1972	15	
1973	38	
1974	764	
1975	0	
1976	-	Data unavailable.
1977	-	Herring fishery closed to foreign nations.
Total	3120	Excludes 1976 catches.

Appendix Table D3. Herring biomass estimates and commercial fisheries data for the Norton Sound District, 1979-1991.

Year	Biomass[a] (st)	Harvest[b] (st)	% Exploitation[c]	Percent Roe	Dollar Value (millions)	Number Fishermen
1979	7,700	1292	16.8	7.0	.6	67
1980[d]	8,400	2452	29.2	8.1	.5	294
1981	25,100	4371	17.3	8.8	1.5	332
1982[d]	17,400	3933	22.6	8.8	1.0	237
1983	28,100	4582	16.3	8.6	1.4	272
1984	23,100	3662[e]	15.8	10.3	.9	194
1985	20,000	3548	17.7	9.9	1.4	277
1986	28,062	5194	18.5	9.6	2.9	323
1987	32,370	4082	12.6[f]	8.6	2.6	564
1988	33,924	4672	13.8[g]	9.0	3.9	348
1989	23,857[h]	4771[i]	20.0[h]	9.2	2.3	357
1990	35,522	6,439[j]	18.0	8.7	3.6	365
1991	42,854	5,671[k]	13.6[i]	9.3	2.4	279

[a] Methods of calculating biomass have varied over the years. Biomass estimates listed follow methods used during that year.
[b] Includes both bait and sac roe harvests.
[c] Represents total District exploitation. During many years southern subdistricts are closed because exploitation of the local biomass reaches 20%, while northern subdistricts have remained open because little or no harvest has occurred.
[d] Minimal biomass estimates due to poor survey conditions.
[e] Includes an estimated 90 st of wastage.
[f] Peak estimate made after the commercial fishery; the fishery was not re-opened due to the high probability of spawnouts present after two consecutive days of heavy spawning.
[g] Peak biomass was sighted prior to arrival of the commercial buying fleet.
[h] Biomass spotting conditions very poor throughout herring season; peak biomass represents minimum estimate; exploitation rate based on observed biomass.
[i] Includes an estimated 30 st of wastage.
[j] Includes an estimated 60 st of wastage.
[k] Includes an estimated 125 st of wastage.

Appendix Table D4. Norton Sound commercial herring harvest (st) by subdistrict by year, 1979-1991.[a]

	Subdistricts							
Year	s.d. 1	s.d. 2	s.d. 3	s.d.4	s.d. 5	s.d.6	s.d. 7	Totals
1979	319	405	555	-	-	-	14	1293
1980	1176	632	632	5	-	7	-	2452
1981	3068	831	471	1	-	-	-	4371
1982	2062	946	925	-	-	-	-	3933
1983	434	1265	2733	-	65	85	-	4582
1984	-	-	3572	-	-	-	-	3572
1985	1538	188	1675	-	147	-	-	3548[b]
1986	2559	-	2450	-	185	-	-	5194
1987	2218	174	1690	-	-	-	-	4082
1988	3260	99	1307	-	6	-	-	4672
1989	3256	60	1425	-	-	-	-	4741
1990	4498	950	931	-	-	-	-	6379[c]
1991	-	880	4792	-	-	-	-	5672[d]

[a] Includes herring taken for sac roe and bait.
[b] Does not include an estimated 90 st of wastage.
[c] Does not include an estimated wastage of 60 st in abandoned gill nets.
[d] Does not include an estimated wastage of 125 st in abandoned gill nets.

Appendix Table D5. Norton Sound commercial spawn-on-kelp (Fucus) harvest, 1978-1984.[a]

Year	st	Fishermen
1978	4	9
1979	13	19
1980	24	20
1981	47	22
1982	38	44
1983	29	35
1984	19	32

[a] Norton Sound commercial spawn-on-kelp harvest closed by regulation prior to the 1985 season.

PORT CLARENCE / KOTZEBUE DISTRICTS

Introduction

The regulation book states that in the Port Clarence and Kotzebue Districts, herring may be taken from April 15 through November 15, except that herring may not be taken during the open commercial salmon fishing season. However, prior to the 1987 season, no spring sac roe commercial fisheries had ever occurred within these districts. Interest in exploring these stocks has been expressed in recent years by industry personnel operating in the Norton Sound District. However, no large scale effort to develop the fishery has occurred due to the late ice breakup and fishery timing in the Port Clarence and Kotzebue Districts.

The Port Clarence and Kotzebue commercial herring fisheries have been in regulation since 1982. The 1983 and 1984 regulation books set a guideline harvest of 150 mt (165 st) for each district. Since the guideline harvest has never been changed or repealed by the Board of Fisheries, it is assumed 165 st guideline harvest is still in effect. Presently purse seines, beach seines, and gill nets are legal commercial gear within these districts.

Local fishermen from Teller, Shishmaref, and Kotzebue have also expressed increasing interest in exploiting these stocks. While small harvests of herring for food/bait have occurred during the fall, the fisheries in these districts have been limited by lack of markets. Local fishermen and fishery operators in Kotzebue, Brevig Mission and Nome have also expressed interest in developing a spawn-on-kelp fishery within these districts.

Resource Investigations

Resource investigations of Port Clarence and Kotzebue Sound area herring stocks were conducted by ADF&G from March 1976-September 1978 (Barton 1978). These studies indicated that herring populations from Golovin Bay (Norton Sound) northward differed significantly in size and behavioral characteristics from herring populations occurring in the southern Bering Sea. Differences between populations were summarized as follows (Barton, 1978).

Seward Peninsula Populations	Southern Norton Sound to Southern Bering Sea Pelagic Populations
Smaller herring at age with lower vertebral counts.	Larger herring with probable higher vertebral counts.
Lower abundance.	Higher abundance
Subtidal spawning (3m) in shallow bays, inlets and lagoons	Intertidal and shallow subtidal spawning along exposed rocky headlands.
Zosteria sp. primary spawning substrate.	Fucus sp. primary spawning substrate.
More euryhaline.	Less euryhaline.
Overwinter in shallow bays; water is warmed by river discharge under ice cover.	Overwinter in deep ocean layers near the Pribilof Islands.
Fall (non-spawning) runs documented	No fall runs documented
Larval development in brackish water	Larval development probable in more saline water.

Data collected from herring populations along the Seward Peninsula strongly indicated that a separate stock of herring occurs in the Port Clarence and Kotzebue Sound areas. This does not preclude the possibility of the occurrence of more southern stocks from utilizing this region, i.e, stocks which winter near the Pribilof Islands and migrate to the western Alaska coast to spawn. It is unlikely however, that herring stocks along the Seward Peninsula migrate to the central Bering Sea for wintering, but rather remain in coastal lagoons, bays or inlets which are warmed by river discharge under the ice (Barton 1978). This may be a major factor in explaining size differences, i.e., environmental conditions. Water temperatures and feeding conditions in deep ocean waters are probably more favorable for growth than those in herring winter habitats along the Seward Peninsula, which apparently have become adapted to Arctic conditions (Barton 1978).

Aerial surveys are very difficult in the Port Clarence District due to organic coloring of the waters of Imuruk Basin, Tuksuk Channel, Grantley Harbor and to a lessor extent, Port Clarence. Aerial surveys were impractical in Imuruk Basin and Tuksuk Channel. Additionally the presence of other species of fish caught in test commercial gear sets indicate the need for verifying any biomass sighted. A further complicating factor within Port Clarence is the spring ice conditions. The Port is a very sheltered body of water which becomes stained to a high degree over the winter and takes some time to clear once the ice melts. Typically, the

outside waters are significantly warmer than the inside waters which are covered by ice longer thereby solar gain and water mixing. Soon after the ice begins to shift the herring move into the warm shallow lagoons to spawn. The herring are invisible to aerial observation once they enter the stained water. The best aerial survey conditions exist just outside the entrance to the Port, where the herring mass just prior to the ice moving. One or two surveys have been flown each of the past three years, but virtually no herring have been observed because the narrow window of time for seeing the fish has been missed.

Fall Food/Bait Fishery

Although a fall fishery has probably existed for subsistence use within these areas for many years, a commercial venture has only been attempted recently. During the fall of 1986, one fisherman sold 130 pounds of fall herring from the Port Clarence District for $1.00 per pound. In 1987, a total of 1,100 pounds of fall herring was sold at $.30 per pound for use as dog food and crab bait. Limited markets will most likely preclude expansion of a fall fishery. Only sporadic sales or exchanges of fall herring occurred in recent years.

Sac Roe Fishery

The Port Clarence fishermen have been unable to attract a sac roe buyer for their relatively late fishery. During 1991, one individual imported Macrocystis kelp and attempted an open pound. No herring spawned on the imported kelp, although ripe herring were found in close proximity and very light spawn was found on blades of Zosteria nearby.

Section 3: KING CRAB

(Includes the Norton Sound and St. Lawrence Island Sections of the Northern District in Area Q)

Section 3: KING CRAB

INTRODUCTION

The Norton Sound section of the Northern District in Area Q is described in the shellfish regulations as all waters east of 168 degrees W. long., between the latitudes of Cape Romanzof and Cape Prince of Wales (Figures 13 and 14). The only shellfish fisheries in Norton Sound are for red king crab (Paralithodes camtschatica). Blue king crab (P. platypus) and tanner crab (Chinochetes opilio) also occur within the section but are very seldom caught by commercial or subsistence fishermen. Red king crab have been utilized for subsistence purposes by local residents for many years, but the commercial fishery was not initiated until eleven years ago. In April 1977, the Alaska Board of Fisheries opened an "exploratory" commercial fishery in order to increase the knowledge and commercial utilization of Norton Sound king crab. Since 1976 there have been six National Marine Fisheries Service (NMFS) research trawl studies in Norton Sound as well as four Alaska Department of Fish and Game (ADF&G) research pot fishing studies (Appendix Table E4).

Prior to the start of the 1988 summer commercial fishery a conservative quota of 200,000 pounds of legal male red king crab was set. Using data collected by NMFS and ADF&G in 1985 (Figure 16) and applying recruitment, harvest, and natural mortality factors observed in subsequent years, the legal male population was estimated to be roughly 2 million pounds. Harvests for the previous five years (1983-1987) had averaged 397,800 pounds. The projected harvest of 200,000 pounds was less than recent year quotas since the 1985 NMFS trawl survey had indicated a slight decline in recruitment for 1987; in addition, there was concern over the lack of current research data and the reduced level of recruitment (22%) observed during the 1987 summer commercial fishery. Also implemented was a harvest strategy adopted by the Alaska Board of Fisheries (5AAC 34.915) in 1981. The harvest strategy (5AAC 34.915) set the optimum yield (O.Y.) in Norton Sound at 1/2 the normal exploitation rate as determined in 5AAC 34.080, to provide protection to a long established subsistence fishery.

During the spring 1988 Board of Fisheries meetings, regulation 5AAC 34.080 was amended. Prior to these changes, harvest strategy guidelines set forth in 5AAC 34.080 determined exploitation rates based on current levels of prerecruit, recruit, and postrecruit crab in the current estimated population. The exploitation rate set during the years 1981-1987 for the summer commercial fisheries was 15% of the estimated population (1/2 the "normal" exploitation rate of 30% as determined by a table previously found in 5AAC 34.080). The regulation change made in 1988 authorized the Department more discretion in setting a harvest guideline of 0-20% of depressed, or threshold (where established or appropriate) populations. In the population estimate provided by the National Marine Fisheries Service in 1988 indicated the red king crab of Norton Sound had maintained a relatively constant legal sized population since 1985. The legal sized biomass was estimated to be 3.0 million pounds in 1988, considerably below the 1978 all time high of 11.0 million pounds. A mandate to maintain adequate abundance for the local subsistence fishery and a concern that funding for population monitoring will decline has caused the staff to set the summer harvest

goal at 200,000 pounds since 1988. Apparently catch plus natural mortality have equaled recruitment from 1985 to 1988. In the 4 years prior to 1988, harvests had averaged 400,000 pounds. By reducing the harvest, handling mortality of females and juvenile crab should be reduced and a broader spectrum of mature male crab will be available for reproduction. Thus, a harvest guideline of 10% of the estimated 2 million pound population of legal male crab was set, which remained in effect through 1990.

An additional regulation which is intended to protect the subsistence fishery is a nearshore closure (approximately 15 miles) to summer commercial fishermen (Figure 14).

Other important regulations for the summer commercial fishery included:

1) A fishing season from August 1 to September 3 or until closed by emergency order. These dates afford protection to soft shell and breeding crabs and are also timed to occur prior to severe winter weather.

2) A minimum carapace width of 4 3/4 inches (121mm) for males. This is for the purpose of allowing males to breed for 1 to 2 years prior to exposure to commercial harvest, although the size at which male crab reach sexual maturity has not been verified by any specific study in the Norton Sound area.

Regulation 5AAC 34.935 (CLOSED WATERS) also allowed the Department the discretion to reduce the closed waters area to allow an efficient harvest of red king crab during the summer fishery.

NORTON SOUND RED KING CRAB

1989 Summer Commercial Fishery

The Norton Sound section commercial red king crab season opened by regulation at noon, August 1. Ten vessels were present on the scheduled tank inspection and registration day, July 31. The 1989 commercial crab fleet consisted of seven catcher-processors and three fishing vessels. The ten vessels brought a total of 2,555 pots to fish in Norton Sound.

The season was open for 3 days. The season was closed by emergency order at noon ADT, Friday August 4, when it was anticipated a harvest of 200,000 pounds of legal male king crab would be reached. The closure announcement was made immediately following the first catch report day (Thursday, August 3) at 11:00 a.m. ADT, which gave the fleet a 25 hour notice.

All fish tickets were not received prior to vessel departure. One fishing vessel tendered his crab for delivery to Dutch Harbor. Very rough seas the day of the closure, and the weekend following, complicated the season closure activities. Analysis of fish ticket data indicates a total of 246,487 pounds was harvested (Table 16A). No significant deadloss was reported. The average price advanced

to the fishermen in season was $3.00 per pound. Thus, the fishery was worth approximately $739,460.00 to the fishermen.

Catches this season were reported for six statistical areas (636401, 646330, 656330, 656401, 666330, and 666401). The average catch per pot pull for the season was 15.4 crab per pot; a total of 79,116 crab were captured in 5,149 pot lifts. The average weight of legal male crab was 3.1 pounds, the same as in 1988 (Table 16A).

Compliance with daily verbal catch reports was good. The Fish and Wildlife Protection officer stationed in Nome was available for answering regulatory questions and to assist with registration and tank inspections. Complaints were received during vessel registration regarding fishing prior to the season (by vessels which arrived during the weekend before the fishery). Without large vessel enforcement support, this problem could not be addressed.

Regulation 5 AAC 30.141 was in effect for the first time in Norton Sound during 1989. This regulation required onboard observers on all seven catcher-processors. In addition, a Department observer was placed on a fishing vessel for the duration of the fishery. Orientation for all observers took place in the Nome office the morning of July 31, prior to tank inspections and registrations. Since this was the first implementation of the mandatory observer program for the Norton Sound fishery, and the program was under scrutiny, careful preparation was made prior to the orientation. Most observer materials (manuals, codes, forms, etc.), were provided by the Dutch Harbor staff member and program coordinator, Alan Quimby. The updated version of the observer manual was provided by HQ. The Dutch Harbor ADF&G staff and F&WP Officer Gallus provided invaluable assistance during and after the Norton Sound fishery. Most problems encountered were related to departure of vessels without checking out or without de-briefing of observers, as required by regulation. Additional documentation and substitute forms were provided to the observers by the Nome staff since the Norton Sound staff required additional or different biological data to be collected. Also, Norton Sound length frequency forms were used since they provided the proper length categories for our stocks, where the minimum legal size male crab is approximately 104mm in length. Although an orientation of data to be collected was given, and a comprehensive addendum was included in the observer manual, there appeared to be a wide range of observer ability to collect and process data. Some inconsistencies occurred which included the following:

1) Inability to properly determine shell age.
2) Incorrect carapace measurements, i.e., legal (width) shell measurements instead of biological (length).
3) Lack of understanding of the concept of "recruit" crab, although it was specifically defined in the manual addendum.
4) Discrepancies in attention to in season catch data to be relayed, which was thoroughly discussed and documented during orientation and in the manual. Some observers gave cumulative rather than daily catch data, as requested. Others had to be repeatedly asked for catch and effort by stat area, rather than totaled for all stat areas fished.
5) Requests for wavier of observer de-briefing, which is required by regulation.

Additionally, there was a wide range of professionalism among observers; some collected the bare minimum, or less, of data, while others performed all tasks completely. Paperwork turned in ranged from very complete and comprehensive, to unusable. Following de-briefing of several observers, Nome staff opted to exclude some observer data from inclusion in the summary report.

A Department observer was on board a fishing vessel during the entire fishery and ended up traveling to Dutch Harbor with the vessel as rough sea conditions prevented off loading in Nome on the evening of August 4. He also summarized all observer data, which is presented in a separate report. A total of 273 pot lifts were observed by the Department observer during the fishery. A total of 4,327 legal male, 1,272 sublegal male, and 1,438 female crab were observed. A total of 293 legal male crab were measured for carapace length and condition; the mean carapace length was 118.4mm (Figure 18); the recruit and post recruit proportions were 23% and 77% (Appendix Table E2).

1988 - 89 Winter Commercial Fishery

Regulation allows a commercial fishery in the Norton Sound Section from December 15 through May 15. During the winter season, crab are taken through the ice near Nome. During the winter of 1988-89, 59 landings were reported by 5 commercial fishermen ranging from January 14 through April 4. A total of 409 crab were sold commercially. Since the market for these crab were residents of Nome the crab were sold whole. The average crab brought $5.40 putting value of the winter fishery at $2210 (Appendix Table E4).

The winter crab fishermen generally use crab pots but some use hand lines to "prospect". Most fishermen consider commercial crabbing to be a sideline and most hold other jobs. During many years, two or three fishermen sell the bulk of the crab. A lack of market has never limited this fishery. Because of the low volume of crab involved, no local processor has found it profitable to operate. The crab sold locally are all sold fresh as are those shipped to Anchorage or other non local markets. During the mid-winter months fishermen find it difficult keeping the crab from freezing. Many Nome residents prefer to buy frozen crab since they are able to extract the meat prior to cooking. Fresh frozen crab are easily marketed in Nome but are not accepted in Anchorage.

1988-89 Subsistence Fishery

Red king crab are utilized by Norton Sound residents mainly during the winter. Fishing occurs through holes or cracks in the ice with the use of handlines and pots. In order to document trends in the subsistence harvest, the Board of Fisheries enacted a regulation in 1977 requiring subsistence fishermen in Norton Sound to obtain a permit prior to fishing and record daily effort and catches on these permits (Table 18A and Appendix Table E4).

After the first commercial harvest of about 1/2 million pounds in the summer of 1977, a successful winter fishery was conducted in 1977-78 when the average subsistence catch was 84 crab and the average winter commercial catch was 260 legal sized crab. The winter fishery declined sharply the following year and

remained at very depressed levels through the 1981-82 season. The lack of success in the winter crab fishery during some past years has been attributed to a declining crab population caused by removal of crab in the summer commercial fishery together with low recruitment, low effort due to poor ice conditions, and changes in the near shore winter distribution of crab. All of these factors probably had some effect on the success of the winter fishery in varying degrees. During the 1978-79 winter fishery, the king crab population was still relatively high. Despite this relatively large population, winter catches were the poorest on record indicating that the major factors limiting winter catches during 1978-79 were probably poor ice conditions and the distribution of crab. During the winter of 1981-82, poor winter catches could more reasonably be attributed to a declining crab population resulting from poor recruitment rather than the effects of commercial catch removals since the crab population was at its lowest documented level. Subsistence fishing success during the winters of 1982-83 through 1986-87 had improved due to a rebuilding of the population and increased use of more efficient gear (pots instead of handlines). Unstable ice conditions and record snowfalls adversely effected the past 2 years catch. In recent years the average harvest per fisherman has been approximately 65 crab (Appendix Table E4).

The winter crab fisheries are limited by the extent that stable shorefast ice extends over nearshore areas. Ice stability seems to have a greater effect in the winter catches than the population size does. Some of the highest winter catches occurred at relatively low population levels (Appendix Tables E4 and E5). The winter of 1988-89 was no exception; record snowfalls caused the sea ice to sink and flood (overflow) making travel difficult and causing some fishermen to shorten their crabbing season.

Since the winter of 1983-84, the permits issued have been more detailed than past years, asking for the gear type used, the sex of the catch, the number of crab caught and the number of crab kept (Table 18A). Permit information again showed that pots were by far the most commonly used gear type. Gear type information is not available from past permits; however, it has been observed that historically the major gear type was handlines. During the season of 1982-83, fishermen began to use pots more frequently.

1990 Summer Commercial Fishery

The Norton Sound section commercial red king crab season opened by regulation at noon, August 1. The 1990 commercial crab fleet consisted of four catcher-processor vessels which were all present on the scheduled tank inspection and registration day, July 31. The four vessels brought a total of 1,388 pots to fish in Norton Sound.

The guideline harvest of legal male red king crab was 200,000 pounds. This conservative quota was set prior to the season using preliminary data from the fall 1988 National Marine Fisheries Service (NMFS) trawl survey, which placed the current population size at less than 1/3 of the historic population level. The population of legal male crab has remained fairly stable since 1985, with no apparent improvement. The guideline harvest level of 200,000 pounds equated to an exploitation of approximately 10%.

This was the second season that the mandatory observer program was in affect for the Norton Sound fishery. Preparation was made prior to orientation in order to prevent observer problems similar to last year from happening again. Observer materials (manuals, codes, forms, etc.), and program coordination was provided by the Dutch Harbor staff member, Alan Quimby. Additional documentation and substitute forms were provided to the observers by the Nome staff in order to obtain pertinent information specific to the fishery.

Once again the observers received an orientation and a comprehensive addendum in the observer manual. Although prior training had been provided by the observer brokers, only two of the four observers performed their duties adequately. One of the remaining two observers was a first timer who did not fully understand his duties and did not bother asking for clarification. The other observer was so busy obtaining what he felt was more important information, he did not have time to gather the basic required data.

Other general observer difficulties were:

1) Inability to properly determine shell age.
2) Incorrect carapace measurements, i.e., questionable biological shell measurements (length).
3) Lack of understanding the concept of "recruit" crab, although it was specifically defined in the manual addendum.
4) Inability to correctly measure legal crab.
5) Failure to turn in completed data forms.
6) Failure to collect minimum daily samples.

Additionally, there was a wide range of professionalism among observers; some collected less than the preferred data while others performed all tasks acceptably. Paperwork turned in ranged from very complete and comprehensive, to unusable. Following the de-briefing of observers, Nome staff opted to exclude some observer data from inclusion in the summary report.

The season was open for 4 days and was closed by emergency order at noon ADT, Sunday, August 5, when it was anticipated a harvest of 200,000 pounds of legal male king crab would be reached. The closure announcement was made following the second catch report (Saturday, August 3) at 9:30 a.m. ADT, which gave the fleet a 26 hour notice.

All fish tickets were received prior to vessel departures. The total reported harvest was 192,831 pounds with no significant deadloss. The average price per pound of landed crab is unknown because all vessels processed their own catches. The catches this season were reported from four statistical areas (656401, 666330, 666401 and 676400). The fleet averaged 18.9 legal crab per pot pulled; a total of 61,563 were captured in 3,255 potlifts. The average weight of legal male crab was 3.1 pounds, the same as in the previous two seasons (Table 16B).

There were no fishing vessels this year on which to place a Department observer even though an employee was dedicated for the task. Therefore, he was assigned to data reporting and analysis along with the completion of a project report. Industry observers reported a total of 168 pot lifts during the fishery. A total of 2,289 legal male, 618 sublegal male, and 36 female crab were recorded. A

total of 1,289 legal male crab were measured for carapace length and condition; the mean carapace length was 121.1mm (Figure 18); the recruit and postrecruit proportions were 21% and 79% (Appendix Table E2).

Overall the season went well. Good weather allowed boarding for tank inspections and registrations of all vessels. Skipper cooperation and compliance with daily verbal catch reports was good. However, one invalid contact address was received during registration and staff was later able to track down the correct address. An inexperienced observer got some attention when he reported over 25% undersize crab but later realized he was using the wrong measuring sticks. No Fish and Wildlife enforcement support available during the season caused some concern in the "what if..." department.

1989-90 Winter Commercial Fishery

Shorefast ice conditions were stable through late winter and early spring. This resulted in a high level of effort and catch. Thirteen fishermen reported selling 3,626 crab during the 1990 winter season (Appendix Table E4). The average reported price per crab was $8.33, which calculates to a total value for the fishery of $30,204.

1989-90 Subsistence Fishery

Stable ice conditions allowed an early start for many subsistence crab fishermen in the Nome area. Relatively high numbers of fishers participated in the winter subsistence harvest. Of the 136 households who were permitted, 118 household reported harvesting 12,152 crab or an average of 114 crab per permit, the highest documented catch rate since permits were first required in 1978. Contributing factors to this high catch rate include: the increased use of pots since the mid-1980s, extensive and stable shorefast ice, and a decrease in winter employment opportunities (Table 18B).

1991 Summer Commercial Fishery

The 1991 summer red king crab commercial season did not take place. The fishery was closed primarily due a budget cut that removed all funding for the Norton Sound shellfish management and research. With two salmon fisheries running simultaneously staffing was inadequate to manage the additional crab fishery in a manner consistent with sustained yield of the resource. The summer fishery is quite intense and the potential for over harvest is great.

1990-91 Winter Commercial Fishery

During the winter of 1990-1991, eleven commercial fishermen reported selling a total of 3,800 red king crab (Appendix Table E4). The market is split between local Nome residents who buy crab directly from the fishermen and Anchorage or non-local markets. Crab sell in Nome for five dollars a piece and Anchorage

prices are around four dollars a pound. The 1990-1991 winter catch was estimated to be worth about 31,000 dollars.

1990-91 Subsistence Fishery

Subsistence harvests were down significantly from the previous season, due to the near record snowfall. The physical effort required to maintain a fishing site was the worst in years. Travel was made difficult for the same reason, the weight of the snow caused seawater to overflow the ice and created fields of slush in late winter and spring. Of the 119 households permitted, 104 reported harvesting 7,366 crab. The harvest rate was 93 crab per household. This catch rate was still above average (Table 18C).

1992 Outlook

There is little information at this time on which to base an outlook for 1992. The NMFS trawl survey data has not been provided yet and the most recent commercial catch data is two years old due to no season in 1991. Recruit percentage has been low since 1987 which would indicate that the fishery would concentrate on relatively old crab again. The harvest goal might be set at 200,000 pounds for 1992 unless the NMFS trawl survey departs from the stable population assessments of the recent past. A further complicating factor is the lack of any budget to manage these fisheries. The lack of a budget was the primary reason for closing the 1991 summer season.

ST. LAWRENCE ISLAND SECTION

1989 Summer Commercial Fishery

The St. Lawrence Island Section includes the American portion of the Bering and Chukchi Seas between Cape Romanzof and Point Hope except the Norton Sound Section. A natural division of the St. Lawrence Section occurs at the Bering Strait. In 1983, the commercial harvest was taken near St. Lawrence Island. Concern over the activity affecting sea mammal abundance near subsistence hunting sites caused the most productive areas to be closed. In 1984, several boats explored north of the Bering Strait but failed to find commercial quantities of crab. From 1984 until 1989, the St. Lawrence Section had virtually no commercial effort.

Immediately after the 1989 Norton Sound closure 5 catcher processors began re-exploring the St. Lawrence Island Section. Five boats spent several days each in the Bering Sea. Their combined catch totaled 29 pounds of red and 940 pounds of blue king crab. The average harvest was roughly 0.2 crabs/pot lift. As expected the best catches came from shoals and rocks outside the closed areas.

Fishing success was only slightly better in the Chukchi Sea. Four boats spent several days each exploring that area. Catch rates approached one legal crab per pot lift along the coast in the northern portion of the section. A total of

3,574 pounds of red king crab and 44 pounds of blue king crab were harvested in the Chukchi Sea.

Five vessels landed 3,603 pounds of red king crab and 984 pounds of blue king crab during the 1989 season from the St Lawrence Island Section. The value of the harvest was estimated to be $13,761 assuming the price remained at $3.00 per pound. Fishing began about August 7 and continued to about August 18. Observers were debriefed in Nome.

No commercial crab vessels have shown an interest to returning to section since the summer of 1989.

Subsistence Fisheries

Winter subsistence fisheries occur on near shore stocks of blue king crab at St. Lawrence and Little Diomede Islands as well as the mainland coast between the villages of Wales and Brevig Mission. Very limited winter harvests of red king crab occur along the mainland coasts north of Shishmaref and near Cape Krusenstern. These subsistence fisheries are not monitored nor actively managed due to their small nature and remote locations.

Table 16A. Commercial harvest of red king crab from Norton Sound, Alaska, by statistical area, 1989 (summer fishery only).

Stat Area	# Vessels	Total Harvest Number	Total Harvest Pounds	Total Pots Lifted	Average Crab/Pot	Average Weight
636401	1	6,676	22,030	695	9.6	3.29
646330	1	1,681	5,212	207	8.1	3.1
656330	2	559	1,757	36	15.5	3.14
656401	7	32,825	100,956	2,139	15.4	3.07
666330	2	406	1,275	24	16.9	3.14
666401	6	36,969	115,257	2,048	18.1	3.11
Totals	11	79,116	246,487	5,149	15.4	3.11

Table 16B. Commercial harvest of red king crab from Norton Sound, Alaska, by statistical area, 1990 (summer fishery only).

Stat Area	# Vessels	Total Harvest Number	Total Harvest Pounds	Total Pots Lifted	Average Crab/Pot	Average Weight
656401	1	61	171	6	10.2	2.8
666330	4	8,162	19,865	374	21.8	2.4
666401	4	49,873	163,950	2,671	18.7	3.3
676400	1	1,036	3,212	121	8.6	3.1
Totals	4	59,132	187,198	3,172	18.6	3.16

Table 17. Norton Sound section red king crab statistical area conversion chart.

NEW (effective 1985)	OLD (pre-1985)
616431	346-45
616401	346-55
616331	346-65
626432	346-34
626402	346-44
626401	346-54
626331	346-64
626301	346-74
636402	346-43
636401	346-53
636330	346-63
636301	346-73
646402	346-42
646401	346-52
646330	346-62
646301	346-72
656402	346-41
656401	346-51
656330	346-61
656300	346-71
666431	347-31
666402	347-41
666401	347-51
666330	347-61
666300	347-71
666230	347-81
676501	347-32
676430	347-42
676400	347-52
676330	347-62
676300	347-72
686500	347-33
686432	--
686431	347-43
686400	347-53
686330	347-63
686301	347-73

Table 18A. Winter 1988-89 subsistence red king crab catches and effort by gear type, Norton Sound, Nome area.

Gear Type	# Fish-ermen	# Males Caught	# Males Kept	# Females Caught	# Females Kept	Total Crab Captured	Total Crab Kept
Pots	26	2,282	1,525	157	26	2,439	1,551
Handlines	35	1,920	1,767	89	9	2,009	1,776
Both	22	3,088	2,620	194	42	3,282	2,662
Unknown	11	206	137	9	0	215	137
Totals	94	7,496	6,049	449	77	7,945	6,126

Table 18B. Winter 1989-90 subsistence red king crab catches and effort by gear type, Norton Sound, Nome area.

Gear Type	# Fish-ermen	# Males Caught	# Males Kept	# Females Caught	# Females Kept	Total Crab Captured	Total Crab Kept
Pots	49	9,396	7,248	973	58	10,369	7,306
Handlines	24	2,186	2,101	25	7	2,211	2,108
Both	15	2,194	1,900	233	54	2,427	1,954
Unknown	19	1,362	781	266	3	1,628	784
Totals	107	15,138	12,030	1,497	122	16,635	12,152

Table 18C. Winter 1990-91 subsistence red king crab catches and effort by gear type, Norton Sound, Nome area.

Gear Type	# Fish-ermen	# Males Caught	# Males Kept	# Females Caught	# Females Kept	Total Crab Captured	Total Crab Kept
Pots	58	6,775	5,834	1,069	149	7,844	5,983
Handlines	6	105	101	4	0	109	101
Both	11	1,258	1,232	34	2	1,292	1,234
Unknown	4	50	48	0	0	50	48
Totals	79	8,188	7,215	1,107	151	9,295	7,366

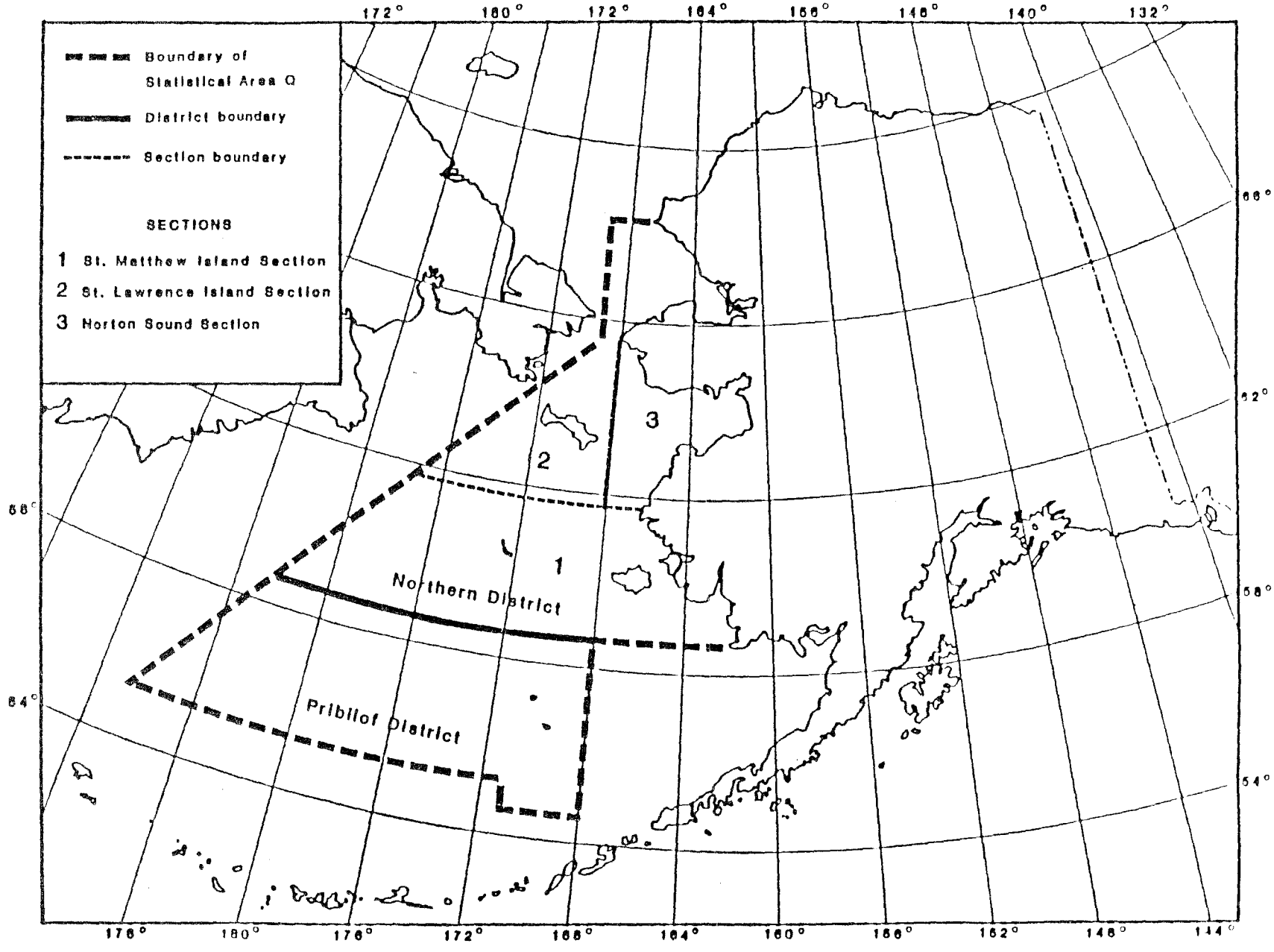
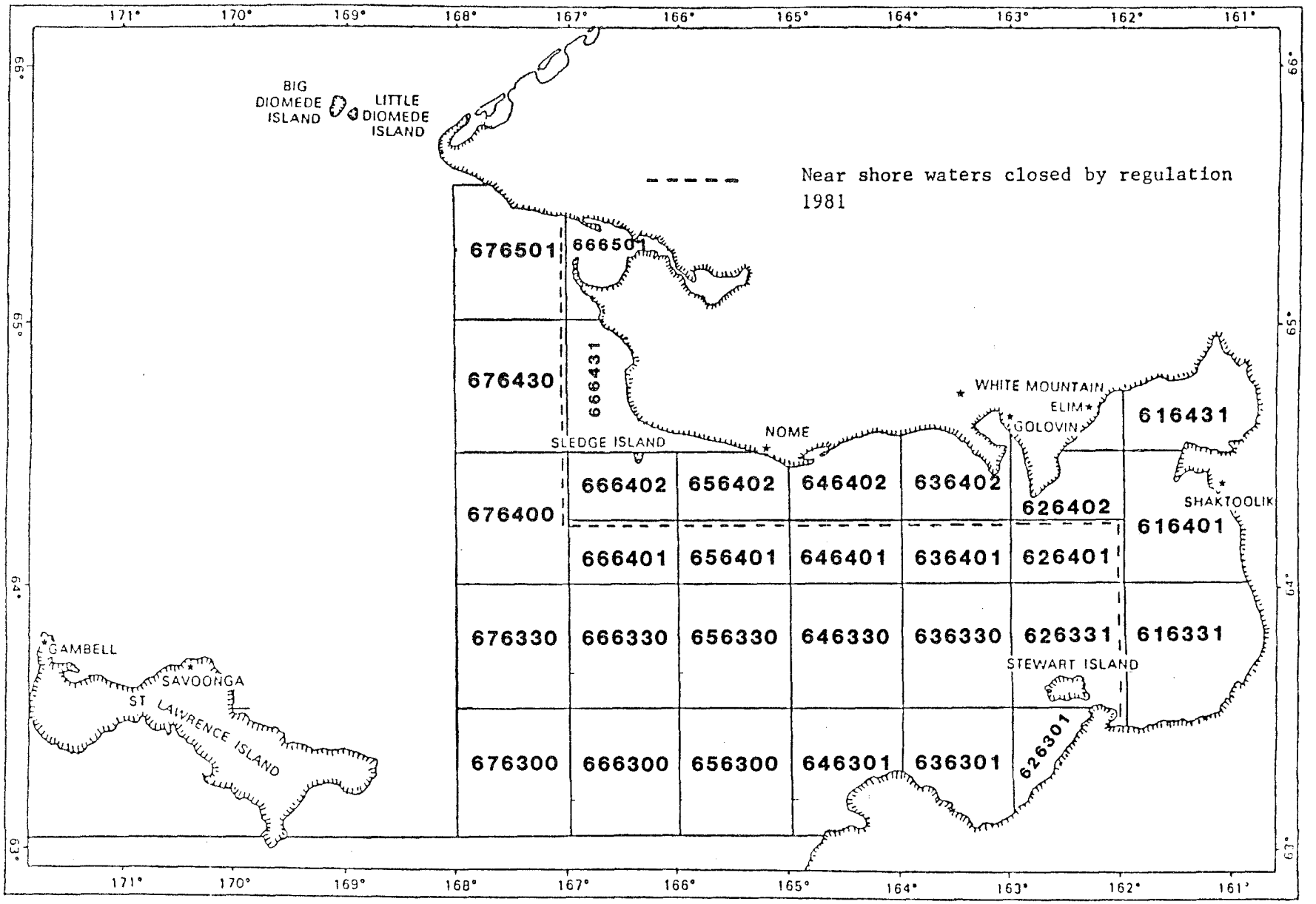


Figure 13. King crab fishing districts and sections of Statistical Area Q

Figure 14. Statistical areas for the Norton Sound Red King Crab Fishery.



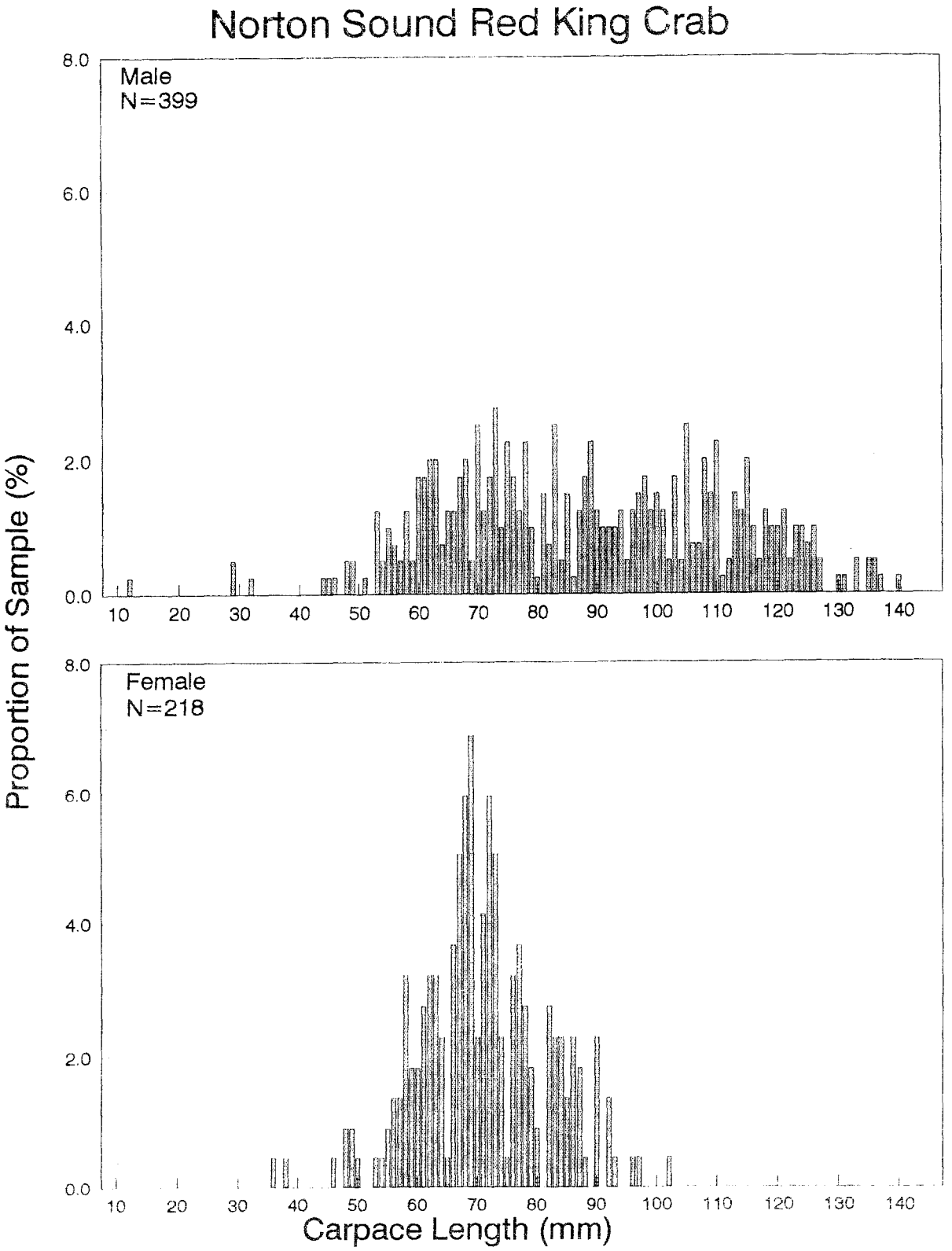


Figure 15. Norton Sound male and female red king crab size distribution from an assessment trawl survey conducted by the National Marine Fisheries Service, 1988.

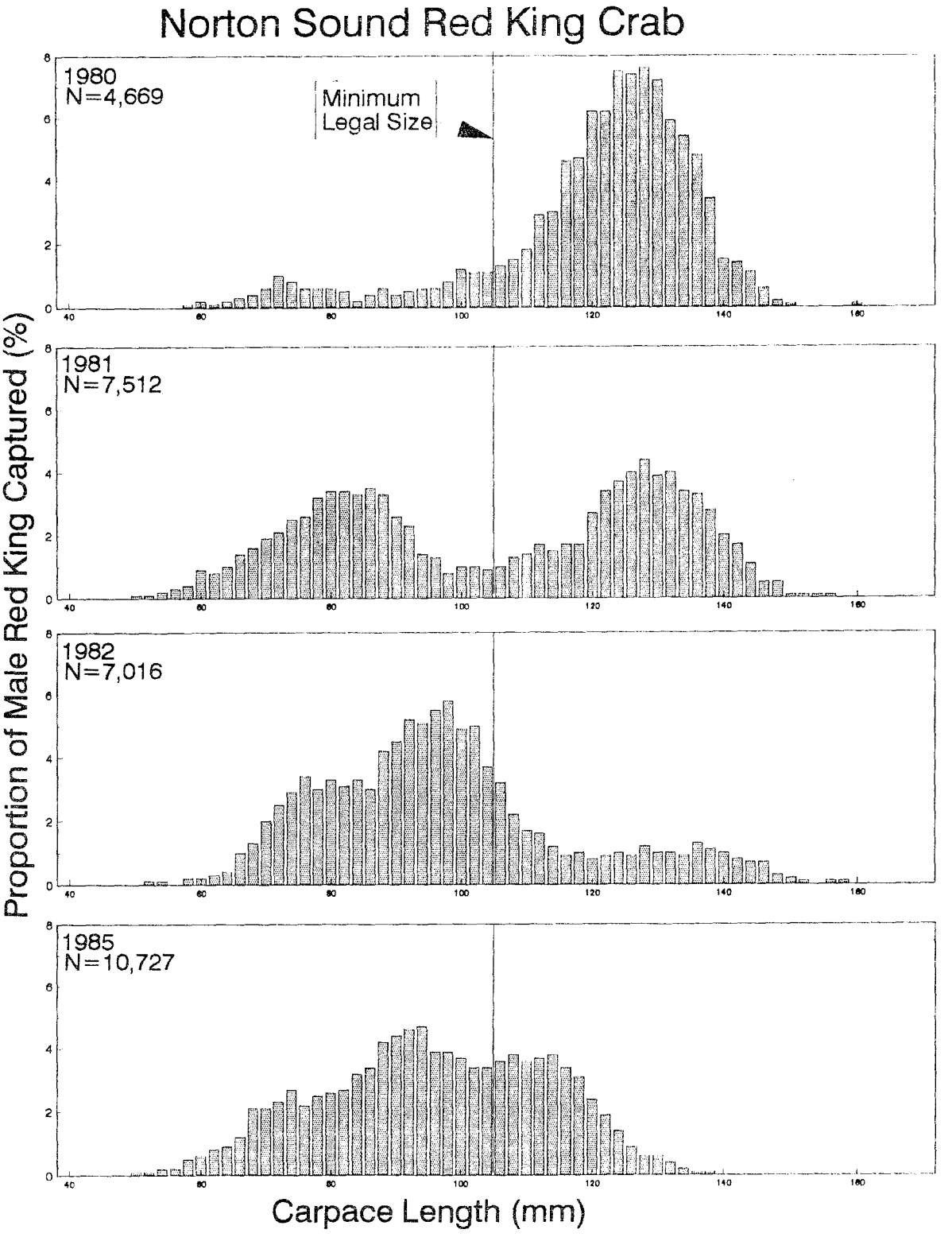


Figure 16. Norton Sound male red king crab size distribution from assessment surveys conducted by the Alaska Department of Fish and Game, 1980, 1981, 1982, and 1985.

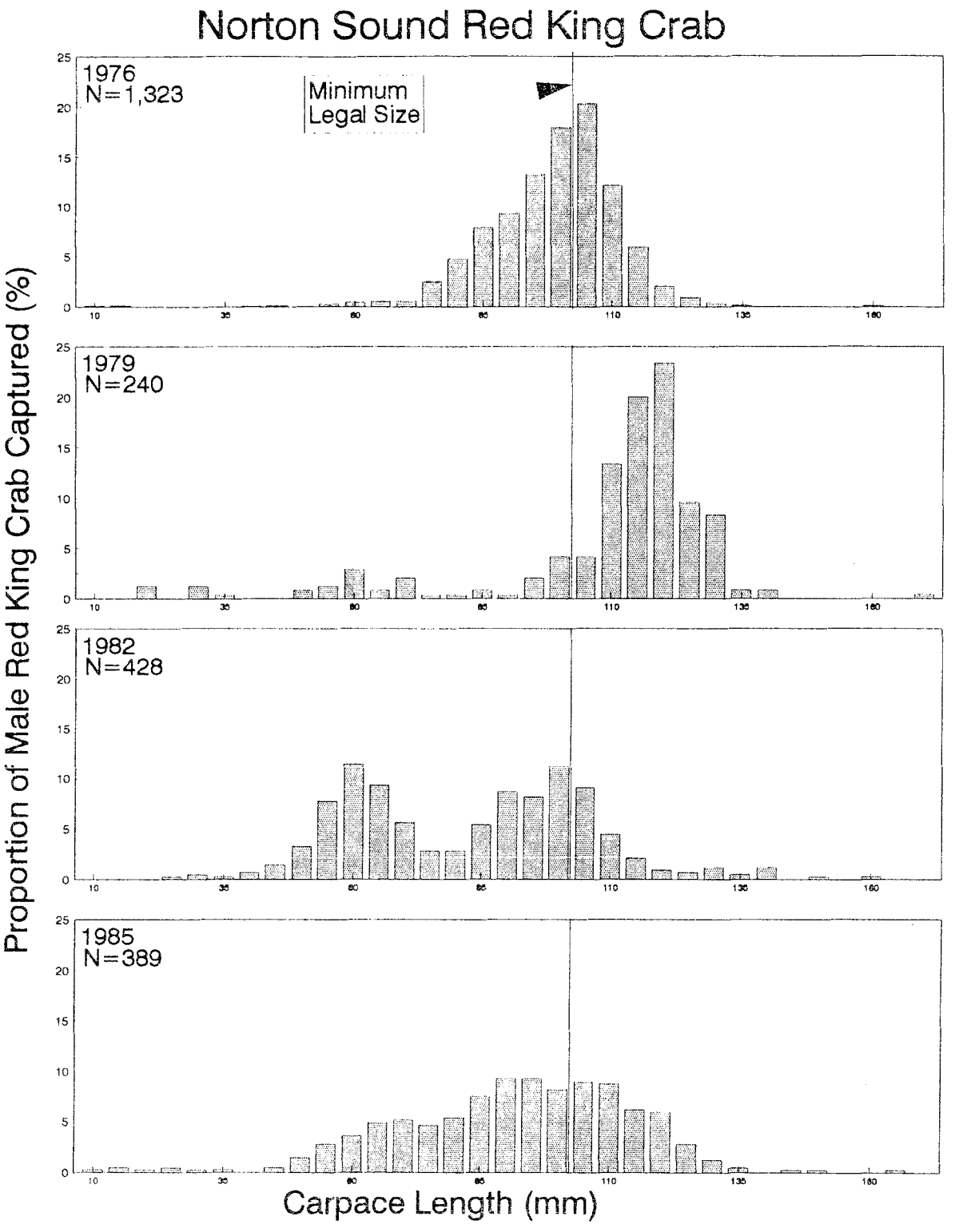


Figure 17. Norton Sound male red king crab size distribution from assessment surveys conducted by the National Marine Fisheries Service, 1976, 1979, 1982, and 1985.

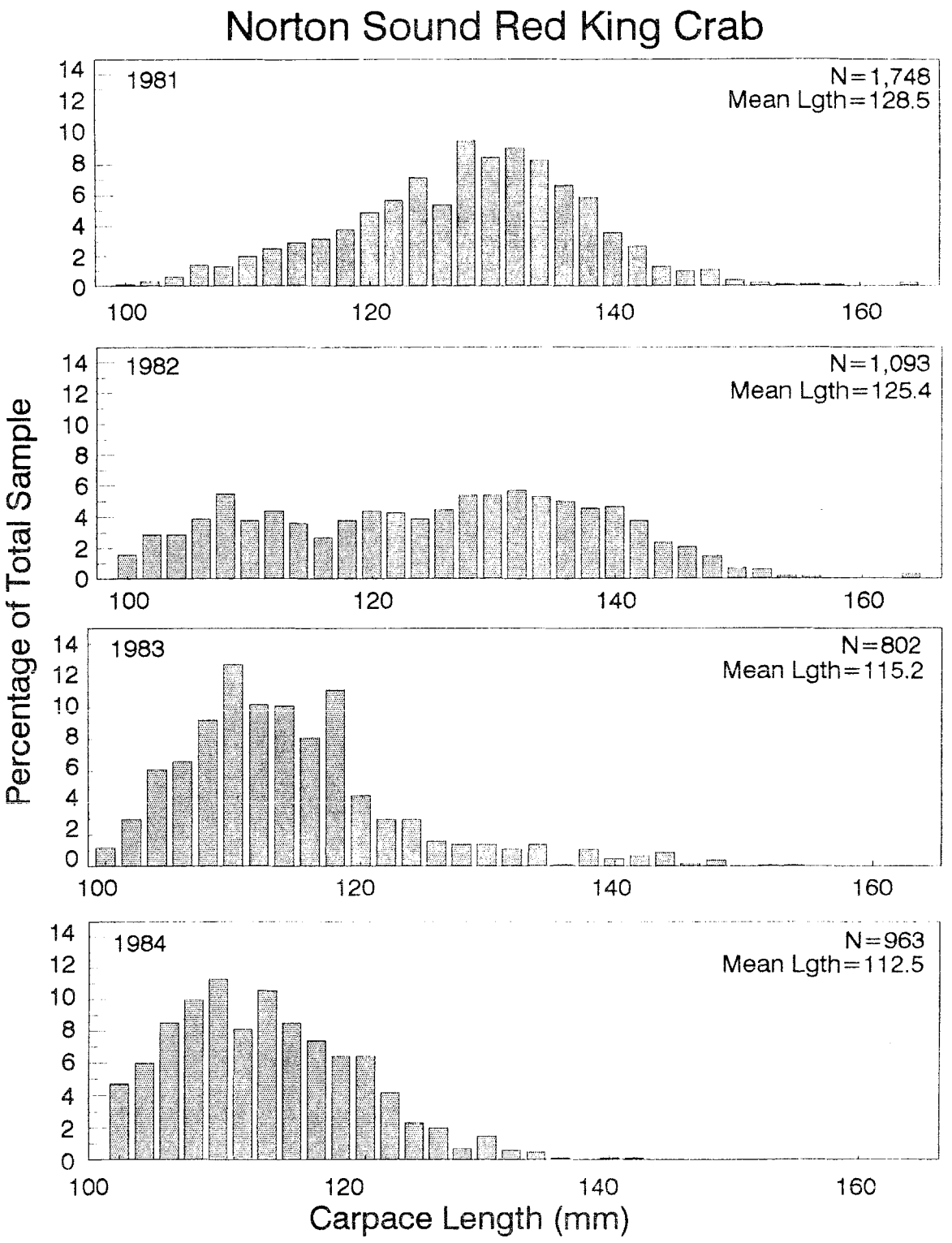


Figure 18. Norton Sound red king crab summer commercial catch samples, 1981-1990.

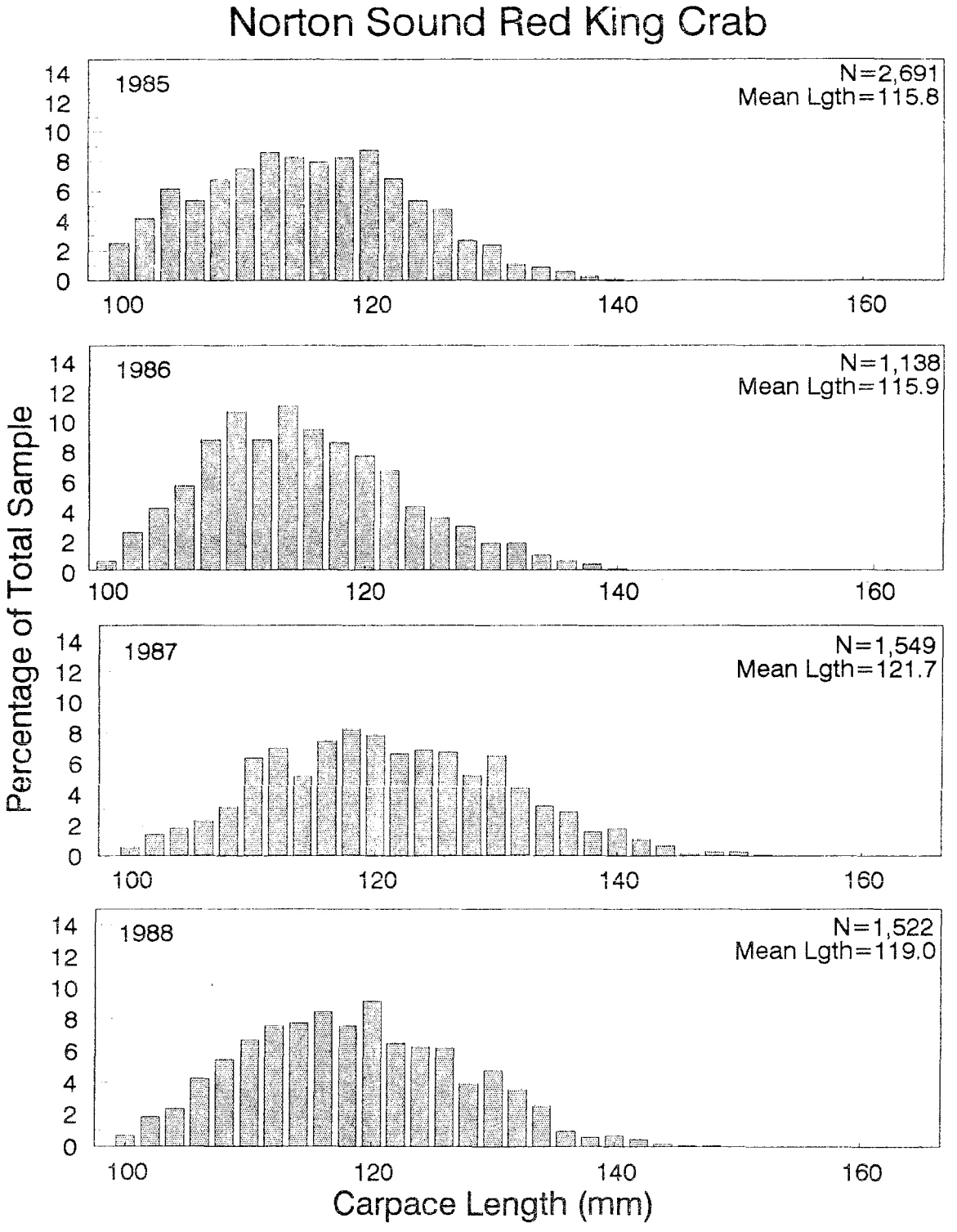


Figure 18. (page 2 of 3)

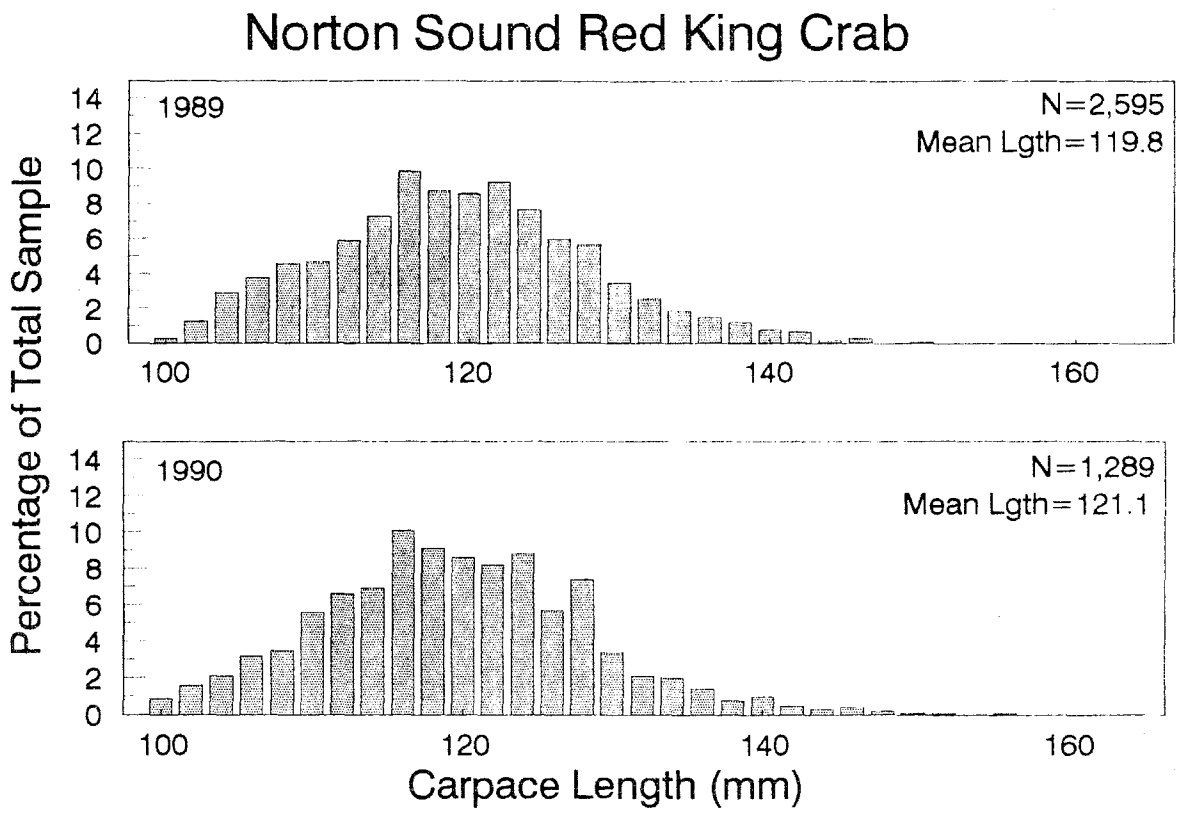


Figure 18. (page 3 of 3)

Appendix Table E1. Comparison of annual commercial harvest of red king crab by statistical area, in Norton Sound, 1977-1990 (catch in pounds).

Statistical Area	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Totals
656402	306,302	90,187	288,869	918	3,098	2,832			132,363						824,569
646402	80,969					748									81,717
626402	38,995														38,995
656401			138,011	121,147	253,387	60,480	11,422	183,119	246,200		194,408	165,644	100,956	171	1,474,774
646401			155,972		1,319	17,532									174,823
636401				12,398	61,823	32,246	5,880	41	891				22,030		135,309
626401	31,572			4,830	399										36,801
656330			323,518	72,735	395,662	3,983	24,246	83,479	7,632		79,006	36,129	1,757		1,028,147
646330					4,716								5,212		9,928
626331	40,020					22									40,042
616331	7,893														7,893
656300			161,699		15,174										176,873
666431			146,029												146,029
676501					36										36
666402	12,036	515,778	534,938	183,581		17,585			32,992						1,296,910
676430		3,811	12,309	-0-	373	3,513			1,171						21,177
666401		179,212	486,947	205,400	381,510	79,580	325,045	116,254	5,341	408,848	50,744	21,895	115,257	162,263	2,376,033
676400		667,130	33,856	274	92,026	1,315	247		32					3,212	794,880
666330		353,016	505,050	367,446	141,513	8,990	1,192		389	70,615	2,963	13,020	1,275	27,185	1,465,469
676330		51,304	81,798	6,762	18,734	-0-									158,598
686330			1,860												1,860
666300		162,795	60,816	84,874	9,167	95		4,534							322,281
676300		13,238		126,231											139,469
666230		55,490			77										55,567
Grand Totals	517,787	2,091,961	2,931,672	1,186,596	1,379,014	228,921	368,032	387,427	427,011	479,463	327,121	236,688	246,487	192,831	11,001,011

Appendix Table E2. Percent recruit size crab for the Norton Sound male red king crab population from commercial catch samples.

Year	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Recruits[1]	53	29	33	15	10	27	55	59	45	49	22	25	23	21
Postrecruits[2]	47	71	67	85	90	73	45	41	55	51	78	75	77	79

[1] Percent Recruits = All new shell, legal size, male crab of carapace length <115mm.
[2] Percent Postrecruits = All other, legal size, male king crab.

Appendix Table E3. Summer commercial red king crab harvest, Norton Sound, 1977-1991.

Year	Legal male Pop. est.[a]	Commercial harvest[b]	Number of vessels	Crab per pot	Average weight	Exvessel price	Fishery value millions $
1976[c&d]	8.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1977[e]	10.0	0.52	7	36	2.7	0.75	0.229
1978[e]	11.0	2.09	8	64	3.0	0.95	1.897
1979[d]	5.4	2.93	34	28	3.0	0.75	1.878
1980	6.6	1.19	9	29	3.6	0.75	0.890
1981	4.7	1.38	36	11	3.7	0.85	1.172
1982	1.3	0.23	11	6	3.6	2.00	0.405
1983	2.1	0.37	23	12	2.8	1.50	0.537
1984	2.7	0.39	8	14	2.8	1.02	0.395
1985	2.4	0.43	6	11	2.9	1.00	0.427
1986[f]	2.8	0.48	3	38	2.9	1.25	0.600
1987[g]	2.2	0.33	9	10	3.2	1.50	0.491
1988[h]	3.2	0.24	2	32	3.1	n.a.	n.a.
1989	3.2	0.25	10	15	3.1	3.00	0.739
1990[h]	3.2	0.19	4	19	3.1	[i]	[i]
1991[j]	0	0	0	0	0	0	0

[a] Population estimate prior to fishery in given year in millions of pounds.
[b] Millions of pounds.
[c] No commercial fishery in 1976.
[d] Population estimate derived by National Marine Fisheries Service.
[e] Population estimate derived from catch per pot from commercial fishery.
[f] Population estimate derived from 1985 ADF&G assessment survey.
[g] Population estimate based on 1985 assessment survey data and recruitment of current assessment data; estimate probably low due to lack of recent data.
[h] Population estimate based on 1988 NMFS post season trawl survey combined with summer fishery harvest.
[i] Data unavailable since all vessels where cather/processors.
[j] No open season in 1991.

Appendix Table E4. Winter commercial and subsistence red king crab harvests, Norton Sound 1978-1991.

COMMERCIAL			SUBSISTENCE						
Year[a]	Fisher-men	#Crab Harvested	Winter[b]	Permits Issued	Permits Returned	Permits Fished	Total Crab Caught[c]	Total Crab Harvested[d]	Average Harvest/fm
1978	37	9,625	1977-78	290	206	149	[e]	12,506	84
1979	1	221	1978-79	48	43	38	[e]	224	6
1980	1	22	1979-80	22	14	9	[e]	213	24
1981	0	0	1980-81	51	39	23	[e]	360	16
1982	1	17	1981-82	101	76	54	[e]	1,288	24
1983	5	549	1982-83	172	106	85	[e]	10,432	123
1984	8	856	1983-84	222	183	143	15,923	11,220	78
1985	9	1,168	1984-85	203	166	132	10,757	8,377	63
1986	5	2,168	1985-86	136	133	107	10,751	7,052	66
1987	7	1,040	1986-87	138	134	98	7,406	5,772	59
1988	10	425	1987-88	71	58	40	3,573	2,724	68
1989	5	403	1988-89	139	115	94	7,945	6,126	65
1990	13	3,626	1989-90	136	118	107	16,635	12,152	114
1991	11	3,800	1990-91	119	104	79	9,295	7,366	93

[a] Prior to 1985 the winter commercial fishery occurred from January 1 - April 30; as of March 1985, the winter commercial harvest may occur from November 15 - May 15.

[b] The winter subsistence fishery occurs during months of two calendar years (as early as December, through May).

[c] The number of crab actually caught; some may have been returned.

[d] The number of crab "harvested" is the number of crab caught and kept.

[e] Data unavailable.

Appendix Table E5. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976.

Year	Date	Research Agency	Vessel	Gear Effort	Number of Red King Crab Captured[1] Sublegal Males	Legal[2] Males	Females	Population Estimates of Legal Male Crab[3] Numbers	Pounds
1976	9/02 - 9/05 9/16 -10/07	NMFS	Miller-Freeman	Trawl 158 tows	768	555	180	3,119,800	8,111,480
1979	7/26 - 8/05	NMFS	Miller-Freeman	Trawl 71 tows	46	194	40	837,241	2,511,723
1980	7/04 - 7/14	ADF&G	Altair	Pots 397 lifts	443	3,290	158	1,900,000	6,600,000[4]
1981	6/28 - 7/14	ADF&G	Altair	Pots 718 lifts	4,097	3,415	1,933	1,285,195	4,755,221
1982	7/06 - 7/20	ADF&G	Aleutian #1	Pots 689 lifts	5,019	2,001	424	353,273	1,271,783
1982	9/05 - 9/11	NMFS	Miller-Freeman	Trawl 50 tows	322	107	265	970,646	2,620,744
1985	7/01 - 7/14	ADF&G	Arctic Sea	Pots 642 lifts	6,086	4,645	181	907,579	2,414,644
1985	9/16 -10/01	NMFS	Argosy	Trawl 78 tows	266	163	151	1,203,000	3,369,000
1988	8/16 - 8/30	NMFS	Miller-Freeman	Trawl 82 tows	258	141	218	1,037,000	3,038,000
1991[5]									

1 Number of crab captured on ADF&G surveys represent data standardized for a 24 hour soak.

2 Legal male red king crab were defined as at least 106mm in carapace length for the 1976 NMFS survey; 105mm for the 1979 and 1985 NMFS survey; and at least 121mm in carapace width for all ADF&G surveys.

3 Population est. are valid for the date of the survey, ie either before or after the summer commercial fishery.

4 The 1980 estimate has been revised from the original estimate of 13.4 million pounds. The original estimate was thought inaccurate due to under-reporting of recovered tagged crab.

5 Data unavailable.

Appendix Table E6. Percent of Norton Sound king crab from winter research pots, percent by size categories.[1]

	SUBLEGAL			LEGAL		
Year	Prerecruit Twos	Prerecruit Ones	Totals	Recruits	Post Recruits	Totals
1983	26	38	64	26	10	36
1984	35	31	66	19	16	35
1985	25	45	70	20	10	30
1986	26	35	61	22	17	39
1987	13	31	44	11	45	56
1988[2]						
1989	27	15	42	27	31	58
1990	16	33	49	25	26	51
1991[3]						

[1] Sublegals = male king crab less than 4 3/4" carapace width.
Pre-recruit Ones = Sublegals greater than 89mm in carapace length.
Pre-recruit Twos = Sublegals smaller than 90mm in carapace length.

Legals = male king crab greater than 4 3/4" carapace width.
Recruits = Legal new shell crab smaller than 116mm in carapace length.
Post-recruits = all non-recruit legal males.

[2] No data collected in 1988 due to poor ice conditions.

[3] Data not compiled at time of report.

Section 4: MISCELLANEOUS SPECIES

(Includes Norton Sound, Port Clarence
and Kotzebue Districts)

Section 4 - MISCELLANEOUS SPECIES

INTRODUCTION

Several species other than salmon, crab and herring are utilized for commercial and subsistence purposes in the Norton Sound, Port Clarence and Kotzebue Districts. Primary species include inconnu or "sheefish" (Stenodus leucichthys), whitefish (Coregonus laurettae, Coregonus pidschian, Coregonus sardinella, Coregonus nasus, and Prosopium cylindraceum). (Coregonus sp., Prosopium sp.), Dolly Varden (Salvelinus malma) and saffron cod (Eleginus gracilis).

The fish are taken by set gill nets, beach seines, "jigging" through the ice, and rod and reel. Subsistence catches taken during the summer months are normally sun-dried, while winter catches are stored frozen. Fish are utilized both for human consumption and for dog feed. Fish taken for commercial purposes are mainly sold locally, although some are shipped from the area.

Subsistence harvest of most species is not limited by regulation. Commercial harvest may be prohibited in some freshwater areas, but limited commercial endeavors are allowed in many areas under terms of a permit.

INCONNU (Sheefish)

The distribution of inconnu includes the Kobuk-Selawik River drainages, and Hotham Inlet of Kotzebue Sound and some Norton Sound drainages, but the largest populations and harvests occur within the former area (Figure 19). In the Kotzebue Sound area, adult fish migrate to upriver spawning areas after ice breakup and to wintering areas within the Hotham Inlet/Selawik Lake area during October-November. Although inconnu are capable of consecutive spawning, most fish spawn every two to three years. Inconnu mature slowly with males reaching maturity at 5-7 years of age and females at 7-11 years.

The inconnu's spawning and overwintering migration behavior makes them available for harvest by the various fisheries throughout their life cycle, and increases their vulnerability to overharvest. In addition, the inconnu's slow maturation rate increases the time required to restore depleted populations.

During the 1960's, age, sex and length data indicated stocks were being overharvested by the commercial and subsistence fisheries in the Kotzebue district. Consequently, an annual area commercial harvest quota of 25,000 pounds of inconnu was instituted, although subsistence catches remained unrestricted.

Commercial Fishery

Most of the commercial fishing effort occurs near Kotzebue in Hotham Inlet. Fishermen use gill nets ranging from 5 1/2 inch - 7 inch stretched mesh which are set under the ice. Recorded commercial catches have remained relatively small; however, undocumented catches are believed to be significant and therefore, harvest totals should be considered minimum estimates. Restricted markets outside

northwestern Alaska limits commercial activity greatly and most individuals who normally participate in the winter commercial fishery also fish for subsistence purposes. During some years, incidentally caught inconnu are also sold by commercial salmon fishermen when there is a market, but only in small amounts.

The commercial sheefish catch for 1990-1991 was taken by 5 permit holders and totaled 825 fish (Appendix Table F1). The total weight was 8,224 pounds that averaged 9.7 pounds per fish. The average price per pound was $.50 for a total fishery value of $4,112.

Subsistence Fishery

Inconnu have long been utilized for subsistence purposes throughout the Kotzebue Basin. Fishermen along the upper Kobuk River fish for inconnu during June through October, while the lower Kobuk and Selawik River residents fish during April through June. Kotzebue and Selawik fishermen fish in the Hotham Inlet and Selawik Lake during the winter months.

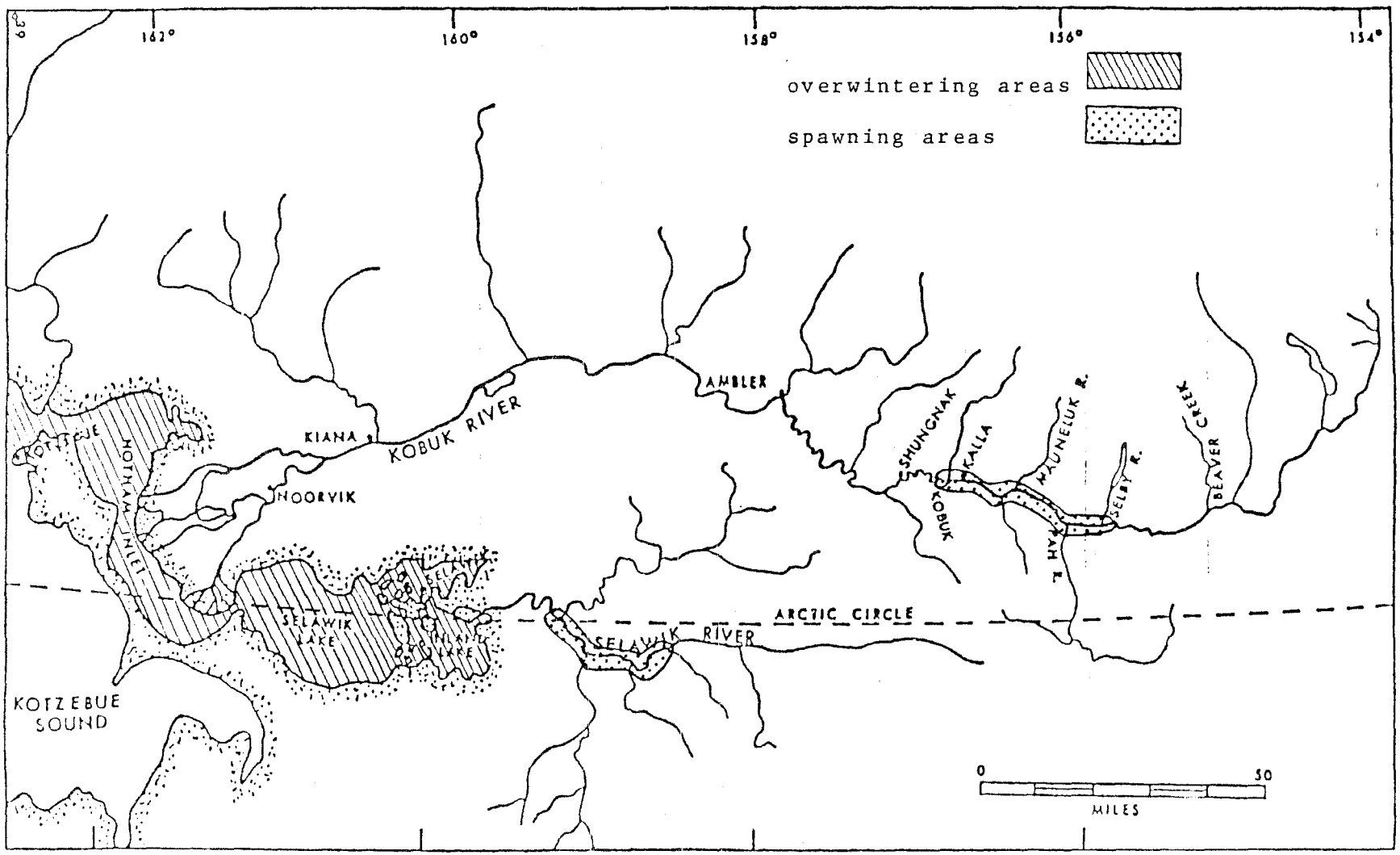
The 1991 winter subsistence harvests of inconnu in Kotzebue Sound and Selawik Lake was 2,180, 40 fishermen were interviewed, and the average catch per fisherman was 55. Historical reported catches are presented in Appendix Table F2.

During the fall of 1988, household interviews were conducted to document subsistence finfish catches, primarily salmon, by residents of the Kotzebue District. Household surveys were conducted in Shungnak, and Noorvik. The survey of the village of Noatak, which is usually surveyed in the fall, was canceled after several attempts due to poor weather. Other villages were not surveyed due to budget restrictions. Mail-in survey calendars were not distributed so subsistence harvest information should be considered very minimal. Few inconnu had been harvested at the time of the survey; many fishermen were still fishing.

Escapement

In recent years aerial surveys have been conducted on key inconnu spawning areas incidental to the effort of enumerating salmon. These surveys have primarily been conducted along the upper Kobuk River in September. Survey conditions historically result in either very few or no inconnu being observed (Appendix Table F3). During these surveys, species identification has been a problem in some years. Surveys were not conducted in 1985 thru 1990 due to high, turbid water, poor weather conditions, or lack of personnel. The 1991 season had unusually good surveying conditions and counted an unusually high number of inconnu in the Kobuk River. Incomplete escapement and catch data provide little basis for assessing the current population status of inconnu in the Kotzebue district, however there is some local concern that the inconnu stocks are declining.

Figure 19. Kotzebue and Kobuk River Valley villages and their spatial relationship with Inconnu spawning and overwintering areas.



Appendix Table F1. Kotzebue District winter commercial inconnu harvest statistics, 1967–1991 [a]

Year [b]	No. of Fishermen	No. of Fish	Pounds		Price/ Pound	Estimated Value
			Total	Average		
1967	[c]	4,000	26,000	6.5	$0.20	$5,200
1968	10	792	4,752	6.0	$0.22	$1,045
1969	17	2,340	15,209	6.5	$0.25	$3,802
1970	[c]	2,206	[c]	[c]	$0.14	
1971	4	73	720	9.9	$0.13	$95
1972	5	456	4,071	8.9	$0.16	$651
1973	11	2,322	15,604	6.7	$0.20	$3,121
1974	6	1,080 [d]	6,265	5.8	$0.30	$1,880
1975	[c]	2,543 [d]	24,161	9.5	$0.30	$7,248
1976	14	2,633	19,484	7.4	$0.30	$5,845
1977	2	566	5,004	8.8	$0.30	$1,501
1978	11	2,879	26,200	9.1	$0.40	$10,480
1979 [e]						
1980	4	1,175	8,225	7.0	$0.50	$4,113
1981	1	278	1,836	6.6	$0.75	$1,377
1982	11	2,629 [f]	17,376	6.6	$0.75	$13,032
1983	8	1,424	13,395	9.4	$0.50	$6,698
1984	5	927 [d]	10,403	11.2	$0.55	$5,722
1985	4	342 [d]	3,902	11.4	$0.51	$1,990
1986	2	26	312	12.0	$0.75	$234
1987	3	670	5,414	8.1	$0.49	$2,653
1988	3	943	7,373	7.8	$0.45	$3,318
1989	8	2,335	16,749	7.2	$0.51	$8,542
1990 [c]	6	687	5,617	8.2	[c]	
1991	5	852	8,224	9.7	$0.50	$4,112

[a] Data is not exact, in some instances total catch poundage was determined from average weight and catch data. Similarly, various price/pound figures were determined from price/fish and average weight data.

[b] Season was from October 1 to September 30. Year indicated would be the year the commercial season ended. For example, the year 1980 would represent October 1, 1979 to September 30, 1980.

[c] Data unavailable or incomplete.

[d] Number of fish not always reported. Estimates were based on average weight from reported sales which documented the number of fish.

[e] No reported commercial catches.

[f] Estimate based on historical average weight.

Appendix Table F2. Reported subsistence inconnu catches, Kotzebue District, 1966-1991. a,d

Year	Number of Fishermen Interviewed	Reported Harvest	Average Catch per Fisherman
1966-67	135	22,400	166
1967-68	146	31,293	214
1968-69	144	11,872	82
1970	168	13,928	83
1971	155	13,583	88
1972	79	3,832	49
1973	65	4,883	75
1974	58	1,062	18
1975	69	1,637	24
1976	57	966	17
1977	95	1,810	19
1978	95	1,810	19
1979	75	3,985	53
1980	74	3,117	42
1981	62	6,651	107
5/82-4/83 [b,c]	130	4,704	36
5/83-4/84 [b,c]	27	764	28
5/84-9/84 [b]	30	2,803	93
1985 [e]	2	60	30
1986 [c,e]	72	721	10
1987 [e]	46	276	6
1988 [e,f]	-	-	-
1989 [e]	-	-	-
1990 [e]	-	-	-
1991	40	2,180	55

[a] To obtain individual village catches during years previous to 1982 refer to the 1982 Annual Management Report.
[b] Catch by village for these years are presented in separate tables in respective year annual management reports.
[c] Summer catches only; winter catches were not documented.
[d] Due to limited survey effort during many years total catch and effort should be regarded as minimum figures only and are not comparable from year to year.
[e] Villages were not surveyed for subsistence inconnu harvests from 1985 to present; figures shown are catches reported during the fall chum salmon subsistence surveys, and may include summer as well as winter catches.
[f] Subsistence inconnu catches not documented.

Appendix Table F3. Annual aerial survey counts of inconnu in the Kobuk and Selawik Rivers, 1966-1991

Date	Kobuk River	Selawik River	Total
09/05/66	1,200	[b]	1,200
09/22/67	1,025	[b]	4,359
09/14/68	4,973	1,234	6,207
09/10/69	3,654	[b]	3,654
09/05/70	3,220	[b]	3,220
08/30/71	8,166	1,196	9,362
08/22/72	[a]	[b]	-
1973	[b]	[b]	-
08/21/74	[a]	[b]	-
08/24/75	[a]	[b]	-
09/02/76	73	[b]	73
1978	[b]	[b]	-
09/12/79	2,824	[b]	2,824
09/11/80	1,772	[b]	1,772
09/15/81	250 [c]	[b]	250
1982	[a]	[b]	[a]
09/19/83	1,009 [c]	[b]	1,009
09/05/84	2,604	[b]	2,604
1985	[b]	[b]	-
1986	[b]	[b]	-
1987	[b]	[b]	-
1988	[b]	[b]	-
1989	[b]	[b]	-
1990	[b]	[b]	-
1991	17,335	[b]	-

[a] No fish reported.
[b] Not surveyed.
[c] Probably more inconnu than listed; species identification problems.

DOLLY VARDEN

Introduction

Dolly Varden (Salvelinus malma) are distributed throughout the Norton Sound, Port Clarence, and Kotzebue districts. Although taxonomists have disagreed on the distinguishing Dolly Varden characteristics and distribution of Arctic Char and Dolly Varden, most taxonomists now agree that char in this area are the northern form of Dolly Varden. In order to eliminate confusion, in this report these fish will be referred to as Dolly Varden, the common name for this species complex.

Dolly Varden in this area are primarily nonconsecutive spawners and spawn throughout the late summer and fall. Fry emerge in the spring and migrate to the ocean during early summer after spending from 1 to 6 (generally 2-5) years in freshwater. Since Dolly Varden are a late-maturing fish (generally age 6-7), they are susceptible to overfishing by commercial, subsistence, and/or sport fisheries. Consequently, commercial fisheries have been maintained at low levels or prohibited to both reduce the potential of overharvest and provide for reproductive and subsistence fishery needs.

Commercial Fishery

Dolly Varden are taken incidentally to chum salmon in the Kotzebue commercial fishery (Tables 10 A,B,C and 11 A,B,C). Regulation changes in 1976, which closed the commercial salmon fishery on August 31, have reduced the harvest of Dolly Varden since in most years Dolly Varden are primarily available for harvest during September. Dolly Varden generally appear in commercial catches during the last three weeks of August (Table 20). Reported Dolly Varden catches are dependent upon available markets. The typical season catch when buyers are purchasing Dolly Varden is between 1,000 to 3,000 fish (Appendix Table F4). The 1991 harvest was significantly higher at 6,136 due to a high Dolly Varden return with a strong pulse fish that moved through the commercial fishery during an open period. Historically two-thirds of the catch is taken on the north side of the district near Sisaulik and the average weight is about 6.5 pounds.

There are several small quota (2,500 pounds) freshwater fisheries in Norton Sound but effort is inconsistent, varying from year to year and stream to stream. Fishermen often buy permits but seldom make commercial sales. In 1989 one fisherman sold 554 pounds of Dolly Varden caught in the Unalakleet River and there have been a couple small sales of less 100 fish more recently.

Subsistence Fishery

Dolly Varden are an important component in the diet of subsistence users in the Norton Sound-Kotzebue Sound areas. Subsistence fishermen catch Dolly Varden with seines in the fall, hook and line through the ice in the winter, and gill nets in the spring. The fall seine fishery contributes the greatest number of fish to the annual subsistence Dolly Varden harvest. Since 1962, seine catches made

by the residents of Kivalina, within the Kotzebue District, have ranged from 12,000 to 49,000 Dolly Varden annually (Appendix Table F5)

Fall seine fishing is a group effort with several households comprising a fishing group. The catch is stored and allowed to freeze in willow cribs located near the seining site. These fish are used throughout the winter by the fishing group (DeCicco 1985). It should be pointed out that the historical subsistence Dolly Varden catches that are summarized in Appendix Table F5 are very minimal figures due to the timing of the surveys conducted. Most Dolly Varden harvest take place prior to or just after freeze-up. The village of Noatak usually fishes prior to freeze-up, while the Kobuk River villages of Shungnak and Noorvik fish for Dolly Varden throughout the winter.

Most villagers in the Norton Sound District report incidental catches of Dolly Varden in their subsistence salmon nets. However, the bulk of the catch is taken by seining in the late fall, after Department subsistence surveys had been completed which made it difficult to estimate subsistence catches in the Norton Sound District. Due to budget restrictions, no subsistence surveys were conducted in the fishing villages of Norton Sound since 1985.

Sport Fishery

Residents of the Kotzebue area and nonlocal residents on wilderness boating trips on the Kobuk and Noatak Rivers are the primary participants in the Dolly Varden sport fishery in the Kotzebue area watershed. Approximately 1,500 Dolly Varden are taken in this fishery annually (Sport Fish Division surveys).

Overwintering Counts

Aerial survey counts of overwintering Dolly Varden on the Wulik River have ranged from 297,257 Dolly Varden in 1969 to 30,923 Dolly Varden in 1984 (Appendix Table F6). Weather and water conditions have precluded flying aerial surveys during many years. When weather permits, the Division of Sport Fisheries conduct aerial surveys of the spawning grounds on the Noatak River in the summer and the overwintering areas of the Kivalina and Wulik Rivers in the fall. During the fall of 1991, 127,000 overwintering Dolly Varden were counted on a survey of the Wulik River (Sport Fish Division survey). The 1991 survey was the second highest ever documented for the Wulik River and another of the Kivilina River also indicated a significantly strong run of Dolly Varden.

Table 19. Incidental Dolly Varden catches in the Kotzebue District commercial salmon fishery by fishing period, 1989-1991.

1989 Season Period	Dates	Hours Fished	Number of Fishermen[a]	Dolly Varden[b] Number	Dolly Varden[b] Pounds
11	8/14-16	48	126	1,992	12,816
12	8/17-19	48	80	827	5,505
13	8/21-23	48	65	225	1,607
14	8/24-26	48	35	32	262
15	8/28-30	48	17	17	103
Totals		240		3,093	20,293

1990 Season Period	Dates	Hours Fished	Number of Fishermen[a]	Dolly Varden[b] Number	Dolly Varden[b] Aveage wt.[c]
6	7/26-27	24	114	8	7.3
7	7/30-31	36	126	91	7.0
8	8/02-03	36	129	70	6.7
9	8/06-07	36	117	146	7.3
10	8/09-10	24	121	289	6.0
Totals		156		604	6.9

1991 Season Period	Dates	Hours Fished	Number of Fishermen[a]	Dolly Varden[b] Number	Dolly Varden[b] Pounds
5	7/25-27	36	102	29	163
6	7/29-31	36	101	2	13
7	8/01-03	36	105		
8	8/05-07	36	102	4	32
9	8/08-10	36	68	9	72
10	8/12-13	24	104	370	2,352
11	8/15-17	48	115	2,753	17,939
12	8/19-21	48	102	2,451	16,534
13	8/22-24	48	69	363	2,576
14	8/26-28	48	46	141	962
15	8/29-31	48	32	14	104
Totals		444		6,136	40,747

[a] Reflects the total number of fishermen delivering during each salmon fishing period shown.

[b] Includes only the number and pounds of Dolly Varden actually sold.

[c] Total weight for season was 4,219 pounds.

Appendix Table F4. Dolly Varden harvested incidentally during the commercial salmon fishery, Kotzebue District, 1966-1991.

Year	Number of Fish Sold	Estimated Total Catch [g]	Pounds Sold [d]	Average Weight Pounds	Average Price per Pound
1966	3,325			7-10	.55 [f]
1967	367		2,606	7.1	.11
1968	3,181		21,949	6.9	.14
1969	1,089 [a]		-	-	2.84 [f]
1970	2,095		-	-	-
1971	3,828 [b]		23,353	6.4	.16
1972	7,746		56,545	7.3	.17
1973	640		4,608	7.2	.16
1974	2,605 [c]		20,580	7.9	.16
1975	-		-	-	-
1976	-		-	-	-
1977	-		-	-	-
1978	1,229		9,094	7.4	.15
1979	2,523		12,523	5.0	.25
1980	3,049		17,015	5.6	.20
1981	3 [e]		16	5.6	.17
1982	3,447		23,648	6.9	.20
1983	190 [e]	845	1,108	5.8	.20
1984	347 [e]	1,090	2,104	6.1	.25
1985	454	3,600	3,177	7.0	.25
1986	5 [e]	2,373	34	6.8	.20
1987	1,261	[h]	8,704	6.9	.30
1988	752	[h]	4,967	6.6	.35
1989	3,093	[h]	20,293	6.6	-
1990	604	[h]	4,219	7.0	.25
1991	6,136	[h]	40,747	6.6	.18

[a] Includes 269 taken by permit.

[b] Includes 179 taken by permit.

[c] Includes 234 taken during commercial inconnu fishery.

[d] Some data extrapolated from average reported weight.

[e] Limited char market; many fish used at home or dumped.

[f] Price per fish.

[g] Estimate includes fish caught but not sold based on interview of fishermen.

[h] Estimate of char caught (but not sold) not made.

Appendix Table F5. Fall subsistence catches of Dolly Varden documented in Kivalina and Noatak, 1959-1991.

Year	Kivalina Number	Kivalina Pounds	Noatak Number [d]
1959 [a]	34,240	85,600	-
1960 [a]	49,720	124,300	-
1962	-	-	27,623
1963	-	-	4,130
1968	49,512	120,214	[e]
1969	64,970	152,750	32,350
1970	33,820	79,420	3,700
1971	29,281	68,518	5,320
1972	48,807	114,637	1,492
1973 [b]			
1979	14,600 [c]	-	9,060
1980	-		7,220
1981	15,000-18,000 [c]	-	3,056
1982	18,438 [e]	-	2,676 [b,f]
1983	16,270 [c]	-	4,545
1984	12,000 [c]	-	2,542
1985	10,500 [c]	-	[g]
1986	7,436 [c]	-	46 [h]
1987	[g]	-	1,376 [h]
1988	[g]	-	[g]
1989	[g]	-	[g]
1990	[g]	-	[g]
1991	[g]	-	4,814

[a] From Saario, Doris J. and Brina Kessel, Environment of Cape Thompson Region, Alaska, published by the U.S. Atomic Energy Commission, 1966.

[b] Storm and ice conditions prevented fall harvest.

[c] Harvest data from Sport Fish Division survey.

[d] No data available on poundage.

[e] Harvest data from Stephen Braund and Associates.

[f] Expanded estimate (see text on subsistence fishery in 1982 Annual Management Report).

[g] Not surveyed.

[h] Subsistence fishermen just beginning to seine at time of the survey.

Appendix Table F6. Aerial survey counts of overwintering Dolly Varden in the Kotzebue District watershed, 1968-1991.

Year	Noatak River Drainage Index Streams [a]	Wulik River [b,e]	Kivalina River [b,e]
1968	-	90,236	27,640
1969 [b]	21,000 [c]	297,257	-
1976	-	68,300	12,600
1977 [d]	-	-	-
1978 [d]	-	-	-
1979	-	55,030	15,744
1980	45,185 [c]	113,553	39,692
1981	5,873	101,826	45,355
1982	6,088	65,581	10,932
1983	4,144 [c]	[d]	[d]
1984	7,444	30,923	5,474
1985	-	-	-
1986	2,025 [f]	5,590	5,030
1987	[g]	[g]	[g]
1988	[g]	80,000 [c]	[g]
1989	[g]	56,384	[g]
1990	5,484	[g]	[g]
1991	7,208	126,985	35,275

[a] Includes July spawner count on the Kelly and Kugururok Rivers, tributaries of the Noatak.

[b] Overwintering char counts conducted in September.

[c] Incomplete survey.

[d] Poor weather hampered/prevented survey.

[e] Surveys conducted by Sport Fish Division since 1979.

[f] Summer spawner count only from the Kelly River. No other Noatak River drainages were surveyed due to poor weather in 1986.

[g] Not surveyed.

WHITEFISH

Introduction

Although inconnu belong to the whitefish family, this section deals with several smaller species of the genera Coregonus and Prosopium. The genus Coregonus contains the "broad" and "humpback" whitefish or C. nasus and C. pidschian, respectively. In addition, three whitefish species known as "ciscoes" belong to this genera; ie., the least cisco (C. sardinella), Arctic cisco (C. autumnalis) and Bering cisco (C. laurettae). "Round" whitefish (Prosopium cylindraceus) are the sole representatives of the genus Prosopium in this area. All species normally spawn in the fall in freshwater.

Whitefish occur throughout most bodies of freshwater in the Norton Sound/Port Clarence/Kotzebue areas and can also be found in inshore marine waters at various times of the year.

Whitefish are harvested to a very limited extent by the commercial and sport fisheries within the area, but are uniformly important to the various subsistence fisheries. Recently, there has been increasing interest in commercial development of this resource, especially in the Kotzebue district.

Commercial Fishery

Limited commercial whitefish harvests have been allowed since statehood, normally under the auspices of a permit which delineated harvest levels, open areas, legal gear, etc. Commercial whitefish fisheries have generally been limited to large open water areas (e.g. Grantley Harbor in the Port Clarence district) or ocean waters. Beach seines have been stipulated as legal gear in some instances in order to reduce the number of incidental species taken. Little comparative commercial catch and effort data have been recorded, but harvest levels have historically been low. A majority of the commercial catches have been made in Golovin Bay within Norton Sound, in the Kuzitrin River of the Port Clarence district, and in Hotham Inlet and Selawik River in the Kotzebue district. The fish have been sold to local markets for human consumption, dog food, or more recently, crab bait.

In the Kotzebue district, a permit to harvest up to 15,000 pounds of whitefish and 3,000 pounds each of pike and burbot was issued to Selawik Fish Project in 1986. The season extends from April to December. Fish sold during June and July of 1986 were purchased as dried fish with an assumed fresh weight of 3 pounds per whitefish (primarily broad and humpback whitefish). A total of 616 whitefish (1,848) pounds were landed by beach seine and gill net. Fishermen received $11 per string of 8 whitefish. Nine permit holders participated in this fishery. Burbot and pike sales were also reported from the Kotzebue district, but will be discussed in the Miscellaneous Finfish Species section. The Selawik whitefish project only operated during the 1984 thru 1987 seasons. In 1989 three fisherman from Kotzebue reported sales totally 470 pounds of whitefish.

Subsistence Fishery

Whitefish have been taken mainly by beach seine or set gill nets. Catches are usually dried and used for human consumption or dog food. In some areas fish are "gutted" and dried early in the summer, while later in the summer the fish are filleted and dried with the eggs and viserca intact.

Subsistence catch enumeration is difficult since fishermen do not count fish individually, but by "tubs", "bags", "strings" or any other estimators of gross abundance. Additionally, many fish have been dried and consumed or stored in caches prior to the survey period. Reported subsistence harvests are the result of a limited and sporadic survey effort and should be regarded as minimum figures and not comparable from year to year. Recent and historical subsistence harvest figures for the Kotzebue district are presented in Appendix Table F7 by year.

Escapement

Whitefish escapements have not been monitored in the past, but there have been no indications from limited Department observations or fishermen interviews of declining populations.

Appendix Table F7. Subsistence whitefish catch and effort data, Kotzebue District, 1970-1988. 1/

Year	Fishermen Interviewed	Number of Fish
1970		58,165
1971		36,012
1974-1976	2/	2/
1977		30,810
1978		77,474
1979	123	43,653
1980	67	49,106
1981	71	37,746
1982	2/	2/
1983	47	16,389
1984	79	28,614
1985 3/	46	5,229
1986 4/	72	11,854
1987 4/	46	20,020
1988 5/	38	14,000
1989		
1990		
1991 4/	63	16,015

1/ Data unavailable prior to 1970. Systematic whitefish catch surveys have never been conducted in the area. This information was collected incidentally with late summer salmon surveys and probably represents only a small fraction of the catch made on a year round basis.
2/ Data unavailable.
3/ Data was expanded based on limited interviews and represents the approximate harvest of fishermen contacted in Kiana and Shungnak only. These figures should be considered very minimal.
4/ Data represents harvest reported from interviews of subsistence fishermen in Shungnak, Noorvik, and Noatak only. Since not all fishermen were contacted and fishing was still occurring at the time of the survey, these figures should be considered minimal.
5/ Data represents harvest reported during fall chum subsistence surveys in Noorvik and Shungnak only; most families still fishing.

SAFFRON COD

Saffron cod, or tomcod as they are called locally, are extensively utilized as a subsistence resource in the Norton Sound, Port Clarence and Kotzebue districts. Tomcod are taken through the ice by jigging as well as with gill nets in open water.

There has never been an extensive commercial fishery on tomcod in the Norton Sound, Port Clarence or Kotzebue areas. During 1980, one fisherman caught and sold 89 pounds (98 tomcod) in the Nome subdistrict. There were no commercial landings during 1982. In 1983, one Nome area fisherman caught and sold 2,548 pounds (4,348 tomcod) and in 1989 one fisherman sold 1,800 pounds locally. These fish were used for dog food, crab bait and human consumption. No commercial deliveries were reported in during 1984-1988.

The Alaska Native Foundation undertook a feasibility study for the development of a dried saffron cod fishery in the Port Clarence/Shishmaref area in 1980. Samples taken to prospective buyers and various markets proved that an economically viable commercial fishery does not exist for this species in this area. If marketing conditions improve and if local residents are willing to participate in a labor intensive dried saffron cod fishery, a commercial fishery for saffron cod could develop.

MISCELLANEOUS FINFISH SPECIES

Other finfish species taken for subsistence in the Norton Sound-Port Clarence-Kotzebue area include: rainbow smelt (boreal smelt), capelin, northern pike, starry flounders, yellow fin sole, arctic flounder, Alaska plaice, grayling, burbot and Pacific herring in the Fall (Appendix G1).

Subsistence utilization of these species has been documented although effort and catch vary widely in scale and importance with locality. Some of these species are important to the subsistence community in certain localities during specific seasons of the year.

Until 1984, sale of any of these species had never been documented in this area, although unreported sales had occurred. The City of Selawik Cooperative Whitefish Project was issued a permit allowing a harvest and sale of up to 1,000 pounds each of burbot and pike as an incidental part of their commercial harvest of whitefish. A total of 1,232 pounds of pike were reported sold locally as dried fish. An amendment to the existing permit was granted allowing up to 1,332 pounds of pike to be harvested so a shipment of an additional 100 pounds could be allowed for a frozen fish market test. No sales of burbot from the Selawik area were reported in 1984.

In 1985, the City of Selawik was issued a permit allowing a harvest of up to 3,000 pounds each of burbot and pike as an incidental part of their commercial whitefish harvest. The total reported harvest of burbot was 81 fish weighing 607 pounds for which the fishermen received $.85 per pound. Pike were sold as fresh or dried fish. A total harvest of 1,228 pike was reported; 196 fish weighing 918 pounds were sold for $.85 per pound; 1,031 pike were sold as dried fish for which

fishermen received $12.00 per string of 6 fish (no weights given). The dollar value of the dried pike was thus $2,064.00; the total dollar value of burbot and pike combined was $3,360.00 during 1985.

In 1986, the City of Selawik was granted a permit to harvest 3,000 pounds each of pike and burbot. A total of 546 pike (approximately 4,368 pounds) were landed by beach seine and gill net and sold. Fishermen received $12 per string of 6 pike. An assumed weight of 8 pounds per pike was used since these fish were sold as dried fish. No burbot sales were reported. The City of Selawik terminated operations after the 1986 season.

Additionally, there were reported sales of 65 burbot (294 pounds) from the Noatak River in 1986 for $.75 a pound and one fisherman from Port Clarence sold 600 pounds of Fall herring at $.45 a pound.

No freshwater fishery permits for pike and burbot were requested in 1986 nor 1987 in the Norton Sound or Port Clarence districts.

There is little information available on the population status and dynamics of many of these species, but there has been no evidence based on limited Department observations and interviews with fishermen, that any of these species are declining in numbers.

Appendix G1. List of common and scientific names of finfish species of the Norton Sound-Port Clarence-Kotzebue Districts.

Arctic lamprey	Lampetra japonica
Arctic char	Salvelinus alpinus
Arctic cod	Boreogadus saida
Arctic flounder	Liopsetta glacialis
Arctic grayling	Thymallus arcticus
Alaska plaice	Pleuronectes quadrituberculatus
Burbot	Lota lota leptura
Bering cisco	Coregonus laurettae
Bering poacher	Ocella dodecaedria
Bering wolffish	Anarhicas orientalis
Blackfish	Dallia pectoralis
Boreal smelt (rainbow-toothed)	Osmerus epselanus
Broad whitefish	Coregonus nasus
Capelin	Mallotus villosus
Dolly Varden	Salvelinus malma
Pond smelt	Hypomesus olidus
Humpback whitefish	Coregonus pidschian
Inconnu (sheefish)	Stenodus leucichthys
Lake trout	Salvelinus namaycush
Least cisco	Coregonus sardinella
Longhead dab	Liranda proboscidea
Ringtail snailfish	Liparis rutteri
Northern pike	Esox lucius
Longnose sucker	Catostomus
Pricklebacks	Stichaeidae
Pacific herring	Clupea harengus pallasi
Rock flounder	Lepidosetta bilineata
Rock greenling (terpug)	Hexagrammus lagocephalus
Round whitefish	Prosopium cylindraceum
Sculpins	Cottidae
Pink salmon	Oncorhynchus gorbuscha
Chum salmon	Oncorhynchus keta
Coho salmon	Oncorhynchus kisutch
Sockeye salmon	Oncorhynchus nerka
Chinook salmon	Oncorhynchus tshawytscha
Saffron cod	Eleginus gracilis
Starry flounder	Platichthys stellatus
Sandlance	Amrodytes hexapterus
Sturgeon poacher	Agonus acipenserinus
Threespine stickleback	Gasterocteus aculeatus
Ninespine stickleback	Pungitius
Tubenose poacher	Pallasina barbata aix
Whitespotted greenling	Hexagrammus stelleri
Yellowfin sole	Limanda aspera

Appendix G2. Studies conducted within the Norton Sound, Port Clarence, Kotzebue Districts, 1989-1991.

Kwiniuk River Salmon Counting Tower

a) Location: About five miles upstream from the mouth of the Kwiniuk River in Norton Sound.

b) Objectives: Determine daily and seasonal timing and magnitude of chum and pink salmon runs. Determine age, sex and size of chinook and chum salmon of the commercial harvest in Moses Point subdistrict.

c) Results: **1989** total expanded tower count: 321 chinook, 187,904 pink and 13,301 chum. The chum salmon sampled in the commercial catch were 1.0% 0.2 (age 3) 68.0% 0.3 (age 4), 28.0% 0.4 (age 5), 1.0% 0.5 (age 6), and 1.0% 0.6 (age 7).

1990 total expanded tower count: 900 chinook, 416,511 pink, and 13,957 chum.

1991 total preliminary expanded tower count: 587 chinook, 54,591 pink, and 18,802 chum.

Unalakleet Salmon Escapement Studies

a) Location: Unalakleet River

b) Objective: To maintain an index of salmon migration up the Unalakleet River using test gill nets.

c) Results:

1989

1) The mean day of catch for chinook, chum, pink, and coho salmon was 6/18, 7/11, 7/20, and 8/16, respectively. The peak daily catch of chinook, chum, pink, and coho salmon occurred on 6/14, 6/27, 7/19, and 8/14, respectively.

2) The predominant age class in the test fish catch by the European aging method, by species was: chinook salmon 1.3 (age 5), chum salmon 0.3 (age 4) and coho salmon 2.1 (age 4).

3) The predominant age class in the commercial catch by the European aging method, by species was: chinook salmon 1.4 (age 6), chum salmon 0.3 (age 4) and coho salmon 2.1 (age 4).

1990

1) The mean day of catch for chinook, chum, pink, and coho salmon was 6/24, 7/22, 7/04, and 8/12, respectively. The peak daily catch of chinook, chum, pink, and coho salmon occurred on 6/22, 7/27, 7/11, and 8/08, respectively.

2) The predominant age class in the test fish catch by the European aging method, by species was: chinook salmon 1.3 (age 5), chum salmon 0.3 (age 4) and coho salmon 2.1 (age 4).

3) The predominant age class in the commercial catch by the European aging method, by species was: chinook salmon 1.4 (age 6), chum salmon 0.3 (age 4) and coho salmon 2.1 (age 4).

1991

1) The mean day of catch for chinook, chum, pink, and coho salmon was 6/24, 7/22, 7/04, and 8/12, respectively. The peak daily catch of chinook, chum, pink, and coho salmon occurred on 6/22, 7/27, 7/11, and 8/08, respectively.

2) The predominant age class in the test fish catch by the European aging method, by species was: chinook salmon 1.3 (age 5), chum salmon 0.3 (age 4) and coho salmon 2.1 (age 4).

3) The predominant age class in the commercial catch by the European aging method, by species was: chinook salmon 1.4 (age 6), chum salmon 0.3 (age 4) and coho salmon 2.1 (age 4).

Noatak River Test Fish Project

a) Location: Lower Noatak River

b) Objectives:

1) To evaluate the feasibility of indexing chum salmon escapement in the Noatak River using systematic drift gill net catches.

2) Begin historical database of chum salmon escapement:

a. Index escapement abundance on a daily and seasonal basis for the Noatak River chum salmon return.

b. Describe the migratory timing of chum salmon in the Noatak River.

c. Estimate the age composition of the Noatak River chum salmon escapement.

c) Results:

1989

1) Fishing began on July 17 and continued through August 24. A total of 1,837 chum salmon were caught in a total of 86 drift time periods.

2) Scale sample analysis from 1,675 chum salmon caught in test drift nets indicated an age composition of 0.5% 0.2 (age 3), 83.5% 0.3 (age 4), 14.9% 0.4 (age 5), and 1.2% age 0.5 (age 6).

1990

1) Fishing began on July 17 and continued through August 24. A

total of 396 chum salmon were caught in a total of 75 drift time periods. Low-clear water conditions throughout season appeared to be the reason for low catches.

2) Scale sample analysis from 374 chum salmon caught in test drift nets indicated an age composition of 1.3% 0.2 (age 3), 47.9% 0.3 (age 4), 48.4% 0.4 (age 5), and 2.4% age 0.5 (age 6).

1991

1) Fishing began on July 24 and continued through August 30. A total of 419 chum salmon were caught in a total of 86 drift time periods. Low-clear water conditions throughout season appeared to be the reason for low catches.

2) Scale sample analysis from 419 chum salmon caught in test drift nets indicated an age composition of 1.9% 0.2 (age 3), 64.2% 0.3 (age 4), 33.2% 0.4 (age 5), and 0.7% age 0.5 (age 6).

Subsistence Fishing Surveys

a) Location: Norton Sound and Kotzebue Districts.

b) Objectives: Determine subsistence utilization of salmon for formulating management procedures and goals.

c) Methods: House-to-house surveys are conducted in selected villages of the Kotzebue District on a rotation cycle each year. Subsistence salmon permit returns in the Nome subdistrict are the only source of information currently used in the Norton Sound District. The remaining fishing villages of the Norton Sound, Kotzebue and Port Clarence Districts, are not normally surveyed due to budget limitations.

c) Results:

1989

1) A total of 30 households were surveyed in the Kotzebue district villages of Shungnak and Noatak. The total reported chum salmon harvest was 5,489 fish.

2) A total of 121 permits of 124 issued for the Nome subdistrict of Norton Sound were returned. Their reported catches totaled 24 chinook, 127 sockeye, 924 pink, 3,399 chum, and 469 coho salmon.

1990

1) A total of 51 households were surveyed in the Kotzebue district villages of Shungnak and Noatak. The total expanded estimate of chum salmon harvest was 8,268 fish.

2) A total of 141 permits of 169 issued for the Nome subdistrict of Norton Sound were returned. Their reported catches totaled

58 chinook, 325 sockeye, 1,937 pink, 4,153 chum, and 409 coho salmon.

1991

1) A total of 44 households were surveyed in the Kotzebue district villages of Shungnak, Noorvik and Noatak. The total reported chum salmon harvest was 9,065 fish.

2) A total of 128 permits of 155 issued for the Nome subdistrict of Norton Sound were returned. Their reported catches totaled 83 chinook, 166 sockeye, 194 pink, 3,715 chum, and 1,279 coho salmon.

Commercial Catch Sampling

a) Locations: Norton Sound, Port Clarence and Kotzebue Sound.

b) Objective: Obtain age, sex, and size information for commercially caught salmon, king crab, and herring.

c) Results: Number of specimens sampled by fishery and year.

Fishery	Year 1989	1990	1991
Kotzebue Salmon	3,336	2,284	3,292
Norton Sound Salmon	938	1,009	965
Norton Sound Herring	786	1,140	1,303
Norton Sound Crab	3,919	1,880	-
Total	8,978	6,313	5,560

Analysis of these data are presented in separate reports.

Noatak River Salmon Counting Sonar Project

a) Location: About 30 miles upstream from the mouth of the Noatak River north of Kotzebue.

b) Objectives: **1989** and **1990** tested the feasibility of deploying salmon counting sonar in the Noatak River.

1991 Develop a data base to be used to evaluate chum salmon escapement of the Noatak River system.

c) Results: **1989** and **1990** the right side of the river was ensonified during the peak of the chum salmon migration and chum salmon were distinguished from most other species. Dolly Varden and other chum sized fish were found to occur in small enough numbers to not be significant in affecting the chum salmon index.

1991 counts were compared to relative strength for in-season run timing which provided information for management decisions in the commercial fishery.

Nearshore Winter King Crab Tagging Study

a) Location: Ocean waters of Norton Sound 5 miles east of Nome to 6 miles west of Nome and 3/4 to 2 miles off-shore

b) Objective: To observe the abundance and distribution of red king crab in nearshore Nome waters. To study migration and estimate the number of repeat crab captures. Also to evaluate the effectiveness of the "15 mile summer commercial crab closure" in protecting inshore crab; to obtain basic life history data.

c) Results:

1989

A total of 557 crab were captured in 42 pot lifts from 6 stations. All crab were measured for carapace length, shell age and sex. Hog rings type tags and elastrators were attached to 200 healthy new shell crab larger than 89mm carapace length.

1990

A total of 2,076 crab were captured in 99 pot lifts from 6 stations. All crab were measured for carapace length, shell age and sex. Hog rings type tags and elastrators were attached to 867 healthy new shell crab larger than 89mm carapace length.

1991

A total of 1,291 crab were captured in 56 pot lifts from 4 stations. All crab were measured for carapace length, shell age and sex. Hog rings type tags and elastrators were attached to 672 healthy new shell crab larger than 89mm carapace length.

Herring Test Fishing

a) Location: Norton Sound ocean waters with effort concentrated near Cape Denbigh, Unalakleet, and Klikitarik.

b) Objectives: To determine age class composition of the Norton Sound herring return through test fishing with variable mesh gill nets.

c) Results: Gill nets were operated from mid-May through mid-June. Scale analysis of test fish catches has been completed and the results are shown in Figures 13 and 14.

Appendix G3A. Emergency orders issued during 1989.

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-H-1-89	May 27, 1989 11:00 am ADT	Opened Norton Sound Subdistricts 1, 2, and 3 to commercial herring gill net fishing.	Aerial surveys have sighted increasing amounts of spawn over the last 3 days. the first reports of spawn on kelp were made on May 26. On May 26 samples from thirteen different locations indicated predominantly ripe fish, a high male:female ratio, and very few "green" or spent herring. There is no reason to delay an opening any longer.
3-Z-H-2-89	May 27, 1989 6:00 pm ADT	Opened Norton Sound Subdistricts 1, 2, and 3 to commercial herring beach seine fishing. Rescinded 3-Z-H-1-89.	The preseason harvest projection allows a 425 st beach seine harvest. Since herring roe is now of marketable quality and no seine harvest has occurred, a three hour beach seine opening will be allowed this evening.
3-Z-H-3-89	May 28, 1989 11:00 am ADT	Reopened Norton Sound Subdistricts 1, 2, and 3 to commercial gill net fishing. Rescinded 3-Z-H-2-89.	Yesterday's catch reports place the total harvest at 1445 st. This harvest stand well below the preseason projected harvest of 4250 st. Since very few "green" or spawned out catches were reported we will continue with yesterdays fishing schedule.
3-Z-H-4-89	May 28, 1989 6:00 pm ADT	Reopened Norton Sound Subdistricts 1, 2, and 3 to commercial beach seine fishing. Rescinded 3-Z-H-3-89.	Beach seine harvests are estimated at 50 st, well below the 425 st quota. Therefore a second opening will be allowed this evening in order to allow a harvest while roe percentages remain at their peak.
3-Z-H-5-89	May 29, 1989 11:00 am ADT	Reopened a 50 fathom limited gill net commercial fishery in Subdistricts 1, 2, and 3. Rescinded 3-Z-H-4-89.	Only 670 st of herring are still available for harvest by gill net. A two hour long, one shakel commercial opening is expected to harvest the remaining surplus.
3-Z-H-6-89	May 29, 1989 4:00 pm ADT	Reopened Norton Sound Subdistricts 1, 2, and 3 to commercial beach seine fishing. Rescinded 3-Z-H-5-89.	Cumulative beach seine harvests now stand at 115 st. This is well below the quota of 425 st. Therefore a third opening is scheduled while roe percentages remain high.
3-Z-H-7-89	May 30, 1989 9:00 am ADT	Reopened Norton Sound Subdistricts 1, 2, and 3 to commercial beach seine fishing. Rescinded 3-Z-H-6-89.	Cumulative beach seine harvests now stand at 220 st. Therefore, another opening is scheduled while roe percentages remain marketable.

-continued-

Appendix G3A. (p. 2 of 4).

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-H-8-89	May 30, 1989 9:00 am ADT	Opened Norton Sound to herring fishing by educational permit holders.	The Bering Straits School District received an educational permit. The open period for this fishery will be set by the area management staff at Unalakleet.
3-S-Z-1-89	June 15, 1989 6:00 pm ADT	Opened Norton Sound Subdistricts 5 and 6 to commercial salmon fishing for 2 twenty-four hour periods each week.	Subsistence salmon catches in ocean waters near Unalakleet and Shaktoolik indicate the chinook salmon migration is well underway. High water and debris has limited the Department test fishery and subsistence fisheries in the Unalakleet River. Because the staff believes the up river chinook migration has begun a schedule of two 24 hour periods per week will be allowed to harvest a portion of the return.
3-S-Z-2-89	June 19, 1989 6:00 pm ADT	Placed Subdistrict 4 on the same fishing schedule as the subdistricts to the south. Rescinded 3-S-Z-1-89.	King salmon continue to move into the rivers in good numbers. If the migration can sustain the levels seen last week during the upcoming week escapement goals should be met.
3-S-Z-3-89	June 22, 1989 6:00 pm ADT	Placed Subdistricts 4, 5, and 6 on the standard commercial salmon fishing schedule of two 48 hour periods each week. Rescinded 3-S-Z-2-89.	The Unalakleet test fishing project indicates strong king salmon escapement. Commercial catch data also indicates a strong return. Fishing time is extended since adequate escapement seems assured.
3-S-Z-4-89	June 29, 1989 6:00 pm ADT	Opened Subdistricts 2 and 3 for a 24 hour test opening.	Buying stations plan to open on June 29 in these subdistricts. We expect a weak run of chum salmon this year so the period is being kept short to allow adequate escapement. Some escapement has occurred, however making a test opening possible.
3-S-Z-5-89	July 3, 1989 6:00 pm ADT	Limited all commercial salmon gill nets to six inch mesh size or smaller.	King salmon escapement is still below the goals. Commercial catch rates have fallen off so it is now important to allow the large egg bearing females to spawn.
3-S-Z-6-89	July 3, 1989 6:00 pm ADT	Placed Subdistricts 2 and 3 on a fishing schedule of two 24 hour periods each week. Rescinded 2-S-Z-4-89.	Chum salmon escapements on Kwiniuk and Fish Rivers seem slightly below normal at this time. A conservative fishing schedule will be allowed at this time. Since the run typically peaks in the coming week the Department staff will closely monitor escapement to insure adequate escapement while maximizing harvests.

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Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-S-Z-7-89	July 13, 1989 6:00 pm ADT	Closed Subdistrict 3 to commercial salmon fishing. Rescinded 3-S-Z-6-89.	Escapement past the Kwiniuk Tower is 10,254 chum salmon. It is likely that total escapement will fall 30% short of the escapement goal since there has only been a fish buyer for one period this year. This closure is intended to maximize chum salmon escapement for the remainder of this migration.
3-S-Z-8-89	July 31, 1989 6:00 pm ADT	Reopened Subdistrict 3 to commercial salmon fishing. Rescinded 3-S-Z-7-89.	Since little can be done now to enhance chum salmon escapement, Subdistrict 3 is reopened to allow for the commercial harvest of coho salmon.
3-S-Z-9-89	August 17.1989 6:00 pm ADT	Allowed the use of either drift or set gill nets for commercial salmon fishing.	Coho salmon escapements are adequate to strong through out Norton Sound. Drifting of gill nets is being tested at this time at the request of Unalakleet fishermen so that a proposed regulation change can be addressed with actual catch comparisons.
3-K-Z-1-89	August 4, 1989 12:00 noon ADT	Closed the Norton Sound Section to commercial king crab fishing.	Judging from the reported harvest and rate of harvest the harvest guideline of 200,000 pounds will be met at the closure.
3-X-S-1-89	July 10, 1989 6:00 pm ADT	Opened the Kotzebue District to commercial salmon fishing.	The preseason management plan states that the commercial salmon season will open July 10, similar to the preceding ten seasons.
3-X-S-2-89	July 25, 1989 6:00 pm ADT	Extended period 4. Rescinded 3-X-S-1-89.	Rapidly changing weather has caused many fishermen to be unable to reach their nets, but further shifts in wind direction are predicted that should allow net checks this evening. The period will now close at 10:00 pm.
3-X-S-3-89	July 31, 1989 8:00 am ADT	Placed the Kotzebue District on a commercial fishing schedule of two 36 hour periods each week.	The seventh fishing period, for the past 10 years, has been 36 or more hours long. The seventh fishing period will begin the normal August fishing schedule.
3-X-S-4-89	August 3, 1989 6:00 pm ADT	Placed the Kotzebue District on a commercial fishing schedule of two 24 hour periods each week. Rescinded 3-X-S-3-89.	The trend established by the the previous four periods is characterized by catches of roughly one-half the 10 year average. The management strategy published priorto the season indicates that fishing time will be restricted should the harvest trend fall below average.

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Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-X-S-5-89	August 7, 1989 8:00 am ADT	Placed the Kotzebue District on the normal August commercial fishing schedule of two 36 hour fishing periods each week. Rescinded 3-X-S-4-89.	Catch rates during periods 4 through 8 had been below the ten year average. The ninth period was significantly above average and the 4 year old age class composed a larger percentage than in past periods. Noatak escapements have also increased recently. Adequate escapement now seems likely at normal harvest rates.
3-X-S-6-89	August 10, 1989 6:00 pm ADT	Placed the Kotzebue District on a commercial fishing schedule of two 48 hour periods each week. Rescinded 3-X-S-5-89.	Catch rates remain above average and escapement on the Noatak River seems adequate. Given the low number of fishermen and apparently strong 4 year old return fishing time is extended.
3-K-A-1-89	August 1, 1989 12:00 Noon	Opened U.S. waters north of Point Hope to commercial king and Tanner crab fishing from Noon August 1 to Noon August 31.	Several crab fishermen have expressed an interest in fishing the Chukchi Sea for king and Tanner crab. Very little fisheries exploration has been done north of the Bering Strait. These fishermen's interest presents an opportunity for the State to assess the crab populations in northern waters and possibly find a population that could support a viable commercial fishery.

Appendix G3B. Emergency orders issued during 1990.

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-H-1-90	May 28, 1990 9:00 am ADT	Opened Norton Sound Subdistricts 1, 2, and 3 to commercial herring gill net fishing.	Aerial surveys have sighted a record biomass of herring moving toward the spawning grounds. Spawning is beginning to effect roe quality and major spawning is expected tomorrow. There is an additional risk of sea ice interfering with the fishery in Subdistrict 1 for the next several days.
3-Z-H-2-90	May 28, 1990 4:00 pm ADT	Opened Norton Sound Subdistricts 1, 2, and 3 to commercial herring beach seine fishing. Rescinded 3-H-Z-1-90.	The beach seine quota has been set at 330 st for the 1990 season. Since marketable herring are now available and forecasts call for weather conditions to deteriorate a three hour opening will be allowed.
3-Z-H-3-90	May 29, 1990 8:00 am ADT	Reopened Norton Sound Subdistricts 1, 2, and that portion of Subdistrict 3 south and east of a line from the channel marker at the mouth of the Shaktoolik River to the west side of Besboro Island to commercial gill net fishing. Rescinded 3-Z-H-2-90.	Roughly 80% of the herring caught at Cape Denbigh on May 28 were below the 7% roe quality standard. Harvesting herring that might later ripen or return in future years is not in the best interest of the State.
3-Z-H-4-90	May 29, 1990 3:00 pm ADT	Reopened Norton Sound Subdistricts 2, and 3 to commercial beach seine fishing.	There is increasing evidence of spawned out fish south of of Unalakleet and in the Cape Denbigh area. In an effort to separate beach seine from gill net gear this afternoon's beach seine opening will berestrictedto the ice free subdistricts north of the gill net fishery.
3-Z-H-5-90	May 30, 1990 9:00 am ADT	Reopened the gill net commercial fishery in Subdistricts 1, 2, and that portion of Subdistrict 3 south and east of a line from the navigation marker at the mouth of the Shaktoolik River to the west side of Besboro Island. Rescinded 3-Z-H-3-90 and 3-Z-H-4-90.	Roughly 4,000 st of herring have been taken to date leaving a considerable portion of the harvestable surplus still available for harvest.
3-Z-H-6-90	May 30, 1990 10:00 am ADT	Reopened Norton Sound Subdistricts 2, and 3 to commercial beach seine fishing. -continued-	The beach seine harvest now stands at 240 st. In order to more closely fill the 330 st harvest guideline, a two hour opening will be allowed.

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Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-H-7-90	May 31, 1990 12:00 Noon ADT	Reopened Subdistricts 1, 2, and 3 to commercial herring gill net fishing. Rescinded 3-Z-H-5-90 and 3-Z-H-6-90.	During the last 24 hours, significant numbers of spawn outs have moved away from the spawning grounds and some new fish have moved in. Sea ice has backed off the beach in Subdistrict 1.
3-Z-H-8-90	June 1, 1990 1:00 pm ADT	Allowed educational permits to fish. Rescinded 3-Z-H-7-90.	The Bering Strait School District has obtained an educational permit. They are being allowed to harvest 10 st of herring as part of an educational program.
3-Z-S-1-90	June 14, 1990 6:00 pm ADT	Opens Norton Sound Subdistricts 5 and 6 to commercial salmon fishing for two 24 hour periods each week.	Subsistence fishermen have reported a strong migration of king salmon in ocean waters at Shaktoolik and Unalakleet since June 9. Others have reported king salmon in the Unalakleet River since June 11. Apparently the upriver migration of king salmon has begun and a limited fishing schedule should allow continued escapement.
3-Z-S-2-90	June 21, 1990 6:00 pm ADT	Placed the Subdistricts 4, 5, and 6 on a commercial fishing schedule of two 48 hour periods each week. Rescinded 3-S-Z-1-90.	King salmon escapement in both the Unalakleet and Shaktoolik Rivers has been fairly strong during the last week. Comercial catches over the last two periods have been average in comparison to the last ten years. Since king escapement appears to be better than averagethe standard fishing schedule will be allowed.
3-Z-S-3-90	June 22, 1990 6:00 pm ADT	Placed Subdistrict 2 on a commercial salmon fishing schedule of five continous days each week.	Since only catcher/sellers are likely to operate in Golovin Bay this season, fishing time has been extended to help those few fishermen maintain the quality of their product.
3-Z-S-4-90	June 25, 1990 6:00 pm ADT	Opened Subdistrict 3 for a commercial fishing schedule of two 24 hour openings each week.	A fish buyer has registered to buy limited quantities of salmon at Moses Point beginning this evening. The reduced fishing schedule is intended to reduce the likelihood of waste and allow a larger escapement than the past three years.

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Appendix G3B. (p. 3 of 4).

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-S-5-90	June 25, 1990 6:00 pm ADT	Placed Subdistrict 2 on the standard commercial fishing schedule of two 48 hour periods each week. Rescinded 3-Z-S-2-90 and 3-Z-S-3-90.	A salmon buyer registered this afternoon to buy from Golovin Bay. Until the chum salmon run can be evaluated as to run strength, The golovin Bay commercial fishery will be placed on the regular summer fishing schedule.
3-Z-S-6-90	July 2, 1990 6:00 pm ADT	Restricted commercial salmon gill nets to a mesh size of no more than 6 inches.	King salmon escapements are now considered average at best. Illegal or unusual harvest methods have been employed on the Unalakleet and Shaktoolik Rivers. King salmon prices are high in relation to chum prices giving no incentive to fishermen to switch to chum gear.
3-Z-S-7-90	July 2, 1990 6:00 pm ADT	Closed the Nome River to subsistence fishing.	Given the poor runs 1985 and 1986 it is unlikely there will be many chums in the Nome River this year. By closing the Nome River now and allowing salmon to migrate to the spawning grounds the Department will be in position to reopen the river in mid-July when pink salmon are more abundant; the food harvest will be supported by a more numerous species.
3-Z-S-8-90	July 2, 1989 6:00 pm ADT	Closed the Nome River to the taking of Chum salmon on sport fishing gear.	The return of chum salmon spawners is expected to be below escapement goal of 2000 chums. In order to rebuild the depleted run of chum salmonon the Nome River, conservative measures are necessary at this time.
3-Z-S-9-90	July 12, 1990 6:00 pm ADT	Restricted commercial salmon gill nets in Subdistrict 3 to not more than four and one-half inches stretched measure.	Chum salmon escapement into the Kwiniuk River is about 60% of the desired return. Conversely, the pink salmon return is near record strength. An experimental fishery on pinks will be allowed and the harvest of chum salmon will be minimized.
3-Z-S-10-90	July 23, 1990 6:00 pm ADT	Reopened the Nome River to subsistence fishing. Rescinded 3-Z-S-7-90.	Roughly 95% of the chum salmon migration is now thought to be in their home streams. There is little reason to continue the subsistence closure on the Nome River. Reopening at this time would allow Pink salmon to be harvested without significant chum salmon catches.

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Appendix G3B. (p. 4 of 4).

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-S-11-90	August 2, 1990 6:00 pm ADT	Increased the commercial mesh size in Subdistrict 3 to not larger than six inches. Rescinded 3-Z-S-9-90.	Nearly the entire chum salmon run has has entered local streams. Since chum salmon escapement is no longer threatened by the commercial fishery, the mesh size is being allowed to enlarge in order to target coho salmon.
3-Z-S-12-90	August 30, 1990 6:00 pm 1990	Extended the commercial fishing season in Subdistricts 4, 5, and 6 to September 8. Rescinded 3-Z-S-2-90.	The coho return appears very strong in Subdistrict 6. This extension will result in a season closure similar to that published in the regulations.
3-Z-K-1-90	August 5, 1990 12:00 noon ADT	Closed the Norton Sound Section to commercial king crab fishing.	Judging from the reported harvest and rate of harvest the harvest guideline of 200,000 pounds will be met at the closure.
3-X-S-1-90	July 9, 1989 6:00 pm ADT	Opened the Kotzebue District to commercial salmon fishing.	The preseason management plan states that the commercial salmon season will open July 9, similar to the preceding eleven seasons.
3-X-S-2-90	July 30, 1990 6:00 am ADT	Extended the commercial salmon fishing periods to the standard August schedule of two 36 hour periods each week.	Three period trends of catch rates indicate a near normal chum salmon return. Kobuk River chum salmon escapement seems adequate. On this basis period length is extended to the normal August fishing schedule.
3-X-S-3-90	August 9, 1990 8:00 pm ADT	Restricted the Kotzebue District to a commercial fishing schedule of two 24 hour periods each week. Rescinded 3-X-S-2-90.	The Noatak test fishing project is recordingthe smallest chum salmon catch in its four years of operation. Fishing time is reduced to allow for greater escapement in the Noatak River.
3-X-S-4-90	August 11, 1990 9:30 am ADT	Closed the Kotzebue District to commercial salmon fishing. Rescinded 3-X-S-3-90.	Aerial surveys have counted roughly one-half the chum salmon desired for escapement in the Noatak River. The four year old age class this season has been weak. Even with a complete closure at this time it seems unlikely that the season's escapement goals can be met.

Appendix G3C. Emergency orders issued during 1991.

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-H-1-91	May 23, 1991 1:30 pm ADT	Opened herring beach seine fishery in Subdistricts 2 and 3, from Spruce Creek to Island Point, including Besboro Island for two hours.	Aerial surveys found herring along the beach in eastern Norton Sound. In the past herring following this pattern have been of good quality. Test samples taken near Blueberry Point within 24 hours had a high proportion of males but were virtually all ripe. Herring quality averaged about 9%. A short opening will be allowed to further evaluate herring quality available at this time. The information gathered will be used to help decide when future fishing periods should occur.
3-Z-H-2-91	May 24, 1991 5:00 pm ADT	Opened Norton Sound herring gill net fishery in Subdistricts 2 and 3, from Spruce Creek to Island Point, including Besboro Island for four hours. Rescinded 3-Z-H-1-91.	Aerial surveys indicated small quantities of high quality herring. Roe quality has been stable. Given the limited amount of herring in suitable gill net areas, a four hour opening will be allowed to test catch rate. An advancing ice pack will close portions of the fishery as it covers them. The relatively large harvest guideline may take several days to harvest.
3-Z-H-3-91	May 25, 1991 11:00 am ADT	Opened Norton Sound herring gill net fishery in Subdistricts 1, 2 and 3, from Spruce Creek to Island Point, including Besboro Island for seven hours. Rescinded 3-Z-H-2-91.	The total herring sac roe harvest now stands at 2453 st. The weighted roe is now about 8.7%. Light spawns were reported the morning of May 25. The gill net harvest set a new record harvest rate of 1.7 st/boat-hour. In the past two days catches, there were virtually no green or spawned-out fish. A seven hour fishing period is being opened to take advantage of the current proportion of mature roe and good abundance of fish before spawning begins and roe percent declines.
3-Z-H-4-91	May 25, 1991 9:00 pm ADT	Opened Norton Sound herring beach seine fishery in Subidstrict 3 from Junction Creek to Island Point. Rescinded 3-Z-H-3-91.	Management strategy of the herring fishery states that the beach seine harvest will not exceed 508st. The harvest to date is 410st and would normally close due to the small amount of allowable catch remaining. All the fishermen signed an agreement that outlined a plan to take only the remaining quota and split the catch between the permits, therefore, the allowable catch would be fully utilized without the threat of overharvest.
3-Z-H-5-91	May 27, 1991 8:00 pm ADT	Opened Norton Sound educational herring gill net fishery in Subdistrict 2 from Spruce Creek to Island Point, including Besboro Island. Rescinded 3-Z-H-4-91.	Over the past two years, a ten ton harvest has been allowed annually for an educational permit held by the Bering Strait School District. A small harvest of this size will not significantly affect the final total fishery harvest. The permit holder will be allowed to fish at their own rate providing they report their catch on a daily basis.

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Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-K-1-91	August 1, 1991 12:00 noon ADT	Closed the summer commercial king crab season in Norton Sound that is normally conducted during August and September.	The budget for king crab management in the Norton Sound and the St. Lawrence Island sections has been eliminated. Population levels are roughly one-third of what they were prior to the commercial fishery. Inadequate control of the summer commercial season could cause the population to decline further.
3-W-01-91	June 15, 1991 11:59 pm ADT	Closed the Sinuk, Cripple, Penny, Snake, Nome, Flambeau, Eldorado, Bonanza and Solomon Rivers, the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge, and ocean waters from Cape Nome jetty west to include the Sinuk River, to the retention of chum and pink salmon from June 15 to July 31, 1991. All chum or pink salmon caught in these waters must be released.	During the last four years, chum salmon and odd year pink salmon escapements in the Nome area have been well below historic levels and the levels the department staff believes are needed to maintain the salmon runs. Increasingly restrictive measures have been taken on the Nome River over the past seven years to encourage increased escapement. The measures have not been effective and if the salmon stocks are not allowed to rebound soon, it is feared that some will cease to exist. Surveys will be made to track the salmon run strengths and if a stream appears to have adequate escapement, restrictions will be lifted in that area, otherwise the restrictions will remain in place until they no longer benefit the species of concern.
3-W-02-91	July 25, 1991 11:59 pm ADT	Reopened the following waters to the retention and possession of chum and pink salmon: the Sinuk, Cripple, Nome, Bonanza and Solomon Rivers, the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge, ocean waters from Cape Nome jetty west to include the Sinuk River. Restrictions remain in effect on the Snake, Penny and Flambeau Rivers.	Recent aerial surveys have indicated that chum salmon escapement goals have been met or exceeded in the Nome, Sinuk, Cripple, Solomon and Bonanza Rivers. The previous closure would have expired on July 31, 1991. This E.O. allows sport fish harvest of salmon in waters where conservation problems do not currently exist and is in accordance with guidelines set forth in the E.O. which closed these waters to the retention of chum and pink salmon.
3-Z-S-1-91	June 15, 1991 11:59 pm ADT	Closed the Nome Subdistrict to subsistence fishing in the Sinuk, Cripple, Penny, Snake, Nome, Flambeau, Eldorado, Bonanza, and Solomon Rivers, the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge, as well as ocean waters from the Cape Nome Jetty west to the Sinuk River mouth from June 16 through July 31.	During the last four years, salmon escapements in the Nome area, especially chum and odd-year pink stocks, have been well below historic levels and the levels the department staff believes are needed to maintain the salmon runs. Salmon stocks have reached dangerously low levels and if not allowed to rebound soon, some will cease to exist. Restrictions to remain in place until they no longer benefit the species of concern.

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Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-S-2-91	June 15, 1991	Moved the commercial fishing opening date for the Nome Subdistrict from July 1 to August 1.	Chum and pink salmon escapements have reached critically low levels in the Nome Subdistrict. Subsistence harvests have been severely restricted. State law requires the Department to (1) manage for sustained salmon runs, and (2) provide for subsistence users before all others.
3-Z-S-3-91	June 17, 1991 6:00 pm ADT	Opened the Koyuk, Shaktoolik and Unalakleet Subdistricts to commercial salmon fishing on two 24 hour periods per week. The fishing periods run from 6:00 pm Monday until 6:00 pm Tuesday and from 6:00 pm Thursday until 6:00 pm Friday. Fishermen will be given the choice of running set or drift gill nets.	Subsistence fishers and the test fishing project have reported modest catches of king salmon since June 10 in the Unalakleet and Shaktoolik Rivers, with higher catch rates reported in the ocean. A limited commercial fishing schedule is expected to allow enough kings up the river to spawn and to provide ample amounts for subsistence and sport use. Drifting will be allowed to minimize the impact of the large amount of driftwood.
3-Z-S-4-91	June 20, 1991 6:00 pm ADT	Opened the Golovin Subdistrict to commercial salmon fishing on a schedule of two 48 hour periods per week beginning at 6:00 pm Thursday, June 20 until further notice.	Subsistence and sport fishermen have reported modest catches of chum salmon from the Fish River. In the past two years, the Golovin Subdistrict has rarely had a commercial fish buyer. Because a market existed when chum had begun their migration up river, Golovin Bay commercial salmon season began with the standard two 48 hour periods each week.
3-Z-S-5-91	June 19, 1991 6:00 pm ADT	Closed the Unalakleet River upstream from South River mouth to subsistence fishing until July 8.	This closure is intended to prevent a few people from harvesting large numbers of king salmon from the deep pools of the lower Unalakleet River before they move on to spawning grounds. Traditional subsistence fishing areas are still open and available for use. Further fishing restrictions are likely if salmon escapements are considered to inadequate for sustaining the run.
3-Z-S-6-91	June 24, 1991 6:00 pm ADT	Placed the Moses Point Subdistrict on a standard commercial salmon fishing schedule of two 24 hour periods per week.	A fish buyer has registered to buy limited quantities of salmon from the Moses Point Subdistrict with the intention of obtaining early high quality chum for the fresh market at a good price. Commercial fishing will be allowed on the assumption that it is still early in the run, the value of the fish will be maximized, and the reduced length of the periods over recent years will allow for acceptable escapements.

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Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-S-7-91	June 24, 1991 6:00 pm ADT	Opened the Koyuk, Shaktoolik and Unalakleet Subdistricts to commercial salmon fishing on a schedule of two 48 hour periods per week. Rescinded 3-Z-S-3-91.	Catch data and test fishing data indicate the peak of the king salmon migration is now in the rivers, with distribution from the spawning grounds to the ocean. The run strength of king salmon in eastern Norton Sound is near average; chum salmon runs throughout western Alaska are very weak. Since king escapement is judged to be adequate, and there's sufficient time to correct a possible over harvest of chum salmon, the standard fishing schedule of two 48 hour periods will be allowed to take advantage of the rising fish prices.
3-Z-S-8-91	June 25, 1991 6:00 pm ADT	Closed the Moses Point Subdistrict of Norton Sound to commercial fishing. Rescinded 3-Z-S-6-91.	The Kwiniuk River counting tower indicated the salmon escapement to be far behind schedule. The recent commercial opening had a slow catch rate with a low total harvest. It became necessary to close commercial fishing to allow for adequate escapement.
3-Z-S-9-91	June 14, 1991 6:00 pm ADT	Restricted commercial salmon gill nets to not more than six inches mesh size throughout Norton Sound effective July 14.	Salmon regulations state that a six inch mesh limit be placed on gill nets between July 1 and July 15. Since the fishing periods begins on July 15, this restriction will be put in place after the last complete period in the time frame to avoid confusion. The fishery managers have made an effort to direct fishing effort away from chum and toward the healthier king run.
3-Z-S-10-91	July 18, 1991 6:00 pm ADT	Closed the Shaktoolik and Unalakleet subdistricts of Norton Sound to commercial fishing. Rescinded 3-Z-S-7-91.	Shaktoolik and Unalakleet River chum salmon escapements are behind schedule as indicated by the aerial surveys of the North and Shaktoolik Rivers, and the Unalakleet test fishing project. Recent commercial openings had normal catch rates with an average harvest. By closing the commercial fishery now the chum escapements should be enhanced with little impact to the commercial silver salmon harvest.
3-Z-S-11-91	July 18, 1991 6:00 pm ADT	Opened the ocean waters of the Nome Subdistrict to subsistence fishing, while maintaining the closure of the Sinuk, Cripple, Penny, Snake, Nome, Flambeau, Eldorado, Bonanza, and Solomon Rivers; and the waters of Safety Sound and Bonanza Channel. Rescinded 3-Z-S-1-91.	Surveys indicated chum salmon escapements are roughly three-quarters of the goal set for the Nome and Sinuk Rivers. Adequate escapement of pink salmon seem assured. By allowing subsistence fishing in the ocean the chum salmon escapement will be protected, while allowing an opportunity for a limited pink salmon harvest.

Appendix G3C. (p. 5 of 6).

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-Z-S-12-91	July 25, 1991 6:00 pm ADT	Reopened the Shaktoolik and Unalakleet subdistricts of Norton Sound to commercial fishing. Rescinded 3-Z-S-10-91.	The counting tower on the Kwiniuk River and aerial surveys of area index streams confirm that chum salmon are well into the local rivers. Since the bulk of the chum salmon run is over, reopening commercial fishing in the Unalakleet and Shaktoolik subdistricts will allow the harvest of coho salmon with limited impact to chum.
3-Z-S-13-91	July 25, 1991 6:00 pm ADT	Opened the Nome Subdistrict to subsistence fishing in the Sinuk, Cripple, and Penny Rivers; that portion of the Nome River downstream of the VOR site on the East bank; Safety Sound; and Bonanza Channel. The Snake, Flambeau, Eldorado, Bonanza, and Solomon Rivers are closed to subsistence fishing from June 16 through July 31. Rescinded 3-Z-S-11-91.	Recent aerial surveys have found chum salmon to be well up most of the area streams with many streams nearing their escapement goals. Many areas of the Nome Subdistrict were reopened because it is felt that there is either adequate numbers to allow subsistence fishing and still maintain good escapement or there would be little benefit in a continued closure. Streams that could be threatened by subsistence fishing or have low returns are identified and shall remain closed.
3-Z-S-14-91	August 1, 1991 6:00 pm ADT	Reopened the Moses Point Subdistrict to commercial fishing on an extended schedule of two 48 hour periods per week. Rescinded 3-Z-S-8-91.	Approximately 90 percent of the chum salmon run is believed to have entered Norton Sound rivers while coho salmon have just begun to arrive. It is felt that coho salmon can be safely harvested with little harm to the depressed chum salmon run. Fishing period length can be increased since it's purpose was to restrict chum salmon fishing time.
3-X-S-1-91	July 11, 1991 8:00 pm ADT	Placed the Kotzebue District on the normal commercial salmon fishing schedule of two 24 hour periods per week.	The commercial fishery opened on July 11 in keeping with the pre-season management plan. Comparisons of catch rate trends over not less than three periods to the recent 12 year average will be the basis of management decisions made this year. Fishing periods during July are held to 24 hours in length, unless catch rates deviate significantly from the average.
3-X-S-2-91	July 25, 1991 8:00 am ADT	Placed the Kotzebue District on a commercial fishing schedule of two 36 hour periods per week. Rescinded 3-X-S-1-91.	The commercial fishing periods will be extended to 36 hours effective July 25, in keeping with the management plan published prior to the season. Comparisons of catch rate trends over the past four periods to the recent 12 year average indicates the chum salmon migration is of average strength at this time. Because less fishermen than normal are participating in the fishery than in the past, additional fishing time will be allowed to compensate for the reduced catch rate.

Appendix G3C. (p. 6 of 6).

Emergency Order Number Norton Sound	Effective Date	Action Taken	Comments
3-X-S-3-91	August 12, 1991 8:00 pm ADT	Placed the Kotzebue District on a commercial fishing schedule of two 24 hour periods per week. Rescinded 3-X-S-2-91.	Period 9 catch rate was down significantly from the previous period and roughly one-eighth of the 12-year average. This may signal the end of the chum salmon migration. The Noatak escapement is currently judged to be roughly one-half strength. Commercial fishing time is reduced to minimize catch and enhance escapement while allowing another fishing period to further evaluate the migrations strength.
3-X-S-4-91	August 15, 1991 8:00 pm ADT	Placed the Kotzebue District on a commercial fishing schedule of two 48 hour periods per week. Rescinded 3-X-S-3-91.	Escapement indices of chum salmon are thought to be adequate. The Noatak River sonar count is roughly 1.5 times last year's count at the same date. Catch rate during the tenth commercial opening was the third highest on record. This indicates a large pulse of salmon migrating to the spawning grounds and increasing likelihood of meeting or exceeding the Noatak River escapement goals.
3-X-S-5-91	August 26, 1991 6:00 pm ADT	Placed the Kotzebue District on a commercial fishing schedule of two 48 hour periods per week. Rescinded 3-X-S-4-91.	On the request of the Kotzebue Fishermens Association Board and some individual fishermen, fishing times are changed due to concern that there is not enough daylight for safe travel or for work after period closures. The extra two hours daylight given by closing earlier should help.

Appendix G4A. Norton Sound-Port Clarence-Kotzebue Sound processors and associated data, 1989.

Company	Address	Processing or Tendering Vessels	Type of Processing	District
Anpac, Inc.	PO Box 92520 Anchorage, AK 99509	p/v Nushagak	Frozen Herrirng Fresh Salmon	Norton Sound Norton Sound & Kotzebue
Arctic Fish	PO Box 706 Kotzebue, AK 99752		Fresh Salmon	Kotzebue
E.O.N.			Fresh Salmon	Kotzebue
Icicle Seafoods	PO Box 79003 Seattle, WA 98199	p/v Bering Star m/v Viking Queen m/v Chichagof m/v Grace C m/v Pintail m/v West Wind	Frozen Herring	Norton Sound
Lafayette Seafoods	4259 22nd Ave W Seattle, WA 98199	p/v Aleutian Falcon m/v Cape Denbigh m/v Deception m/v Entrance Point m/v Tracy D m/v Bull Harbor m/v Dancer m/v Sea Trek III m/v Zingaro	Frozen Herring	Norton Sound
N.A.N.A. Seafoods	PO Box 49 Kotzebue, AK 99752		Fresh Salmon	Kotzebue
New West Fisheries	1100 11th St. Bellingham, WA 98225	p/v New West m/v Barge m/v Norma Jo m/v Echo	Frozen Herring	Norton Sound
Northland Fisheries		p/v Northland m/v Kona m/v Sea Fisher	Frozen Herring	Norton Sound
Pan Pacific Seafoods	150 Nickerson S. Suite 108 Seattle, WA 98109	m/v Excito	Frozen Herring	Norton Sound
Trident Seafoods	5303 Shilsho Ave. Seattle, WA 98107	p/v Alaska Packer p/v Neptune p/v Sea Alaska m/v Prince William Sound m/v Catchalot m/v Alaska Eagle m/v Dritsik m/v Alaska Shores m/v Tempest m/v Seldovia m/v Lois Anderson m/v Maverick m/v Balena m/v Arctic Sun m/v Amatuli	Frozen Herring	Norton Sound

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Company	Address	Processing or Tendering Vessels	Type of Processing	District
Unisea, Inc.		m/v Skagit Eagle m/v Response	Frozen Herring	Norton Sound
Whitney Foods	4401 W Intl Airport Rd Anchorage, AK 99502		Fresh Salmon	Norton Sound & Kotzebue
Y.A.K., Inc.	4091 21st Av. W. #202 Seattle, WA 98199	m/v Blue Fin m/v Prelude m/v Yankee Clipper	Frozen Herring	Norton Sound

Appendix G4B. Norton Sound, Port Clarence, and Kotzebue Sound processors and associated data, 1990.

Company	Address	Processing or Tendering Vessels	Type of Processing	District of Operation
Anpac, Inc.	PO Box 92520 Anchorage, AK 99509	p/v Nushagak m/v Willhull Too	Frozen Herring Fresh Salmon	Norton Sound & Kotzebue
Arctic Fish	PO Box 706 Kotzebue, AK 99752		Fresh Salmon	Kotzebue
E.O.N.			Fresh Salmon	Kotzebue
Icicle Seafoods	PO Box 79003 Seattle, WA 98199	p/v Bering Star m/v Discovery Star m/v Chichagof m/v Grace C m/v Cordova m/v Norpac m/v Roberta M m/v Tani Rae m/v Triton m/v Kupreanof m/v Mitkof	Frozen Herring	Norton Sound
Lafayette Seafoods	4259 22nd Ave W Seattle, WA 98199	p/v Pribilof p/v Lafayette m/v Cape Denbigh m/v Deception m/v San Michelle m/v Tracy D m/v Bull Harbor m/v Chatham m/v Northwind m/v Zingaro m/v Criss Ann m/v Shypoke m/v Midas m/v Pintail	Frozen Herring	Norton Sound
N.A.N.A Seafoods	PO Box 49 Kotzebue, AK 99752		Fresh Salmon	Kotzebue
New West Fisheries	1100 11th St. Bellingham, WA 98225	m/v New West m/v Rogue m/v Norma Jo m/v Echo m/v Wanderer m/v Rebel		Norton Sound
Pan Pacific Seafoods	150 Nickerson S Suite 108 Seattle, WA 98109	p/v Pacific Producer m/v Ramblin Rose m/v Maverick m/v Viva Yo m/v Exito m/v Gulf Winds m/v Pacific Packer m/v Pavlof	Frozen Herring	Norton Sound
Trident Seafoods -continued-	5303 Shilsho Ave. Seattle, WA 98107	p/v Bristol Monarch p/v Neptune m/v Lowboy m/v Prince William Sound m/v Pankof	Frozen Herring	Norton Sound

Company	Address	Processing or Tendering Vessels	Type of Processing	District of Operation
Tident Seafoods (cont.)		m/v Alaska Eagle m/v Tamar m/v Alaska Shores m/v Tempest m/v Seldovia m/v Lois Anderson m/v Westling m/v Balena m/v Arctic Sun m/v Westwind		
Whitney Foods	4401 W Intl Airport Rd Anchorage, AK 99502		Fresh Salmon	Norton Sound & Kotzebue
Woodbine Alaska Fish Co.		m/v Woodbine m/v Responce m/v Nushagak Spirit m/v Naknek Spirit m/v Captain Banjo		Norton Sound
Y.A.K., Inc.	4091 21st Ave W #202 Seattle, WA 98199	p/v Polar Queen m/v Blue Fin m/v Prelude m/v Yankee Clipper m/v All American	Frozen Herring	Norton Sound

Appendix G4C. Norton Sound-Port Clarence-Kotzebue Sound processors and associated data, 1991.

Company	Representative Address	Processing or Tendering Vessels	Type of Processing	District
Anpac, Inc.	PO Box 92520 ford Anchorage, AK 99509	p/v Nushagak	Frozen Herring Fresh Salmon	Norton Sound & Kotzebue
Arctic Fish	PO Box 706 Kotzebue, AK 99752		Fresh Salmon	Kotzebue
E.O.N.			Fresh Salmon	Kotzebue
Icicle Seafoods	PO Box 79003 Seattle, WA 98199	p/v Bering Star p/v Discovery Star m/v Chichagof m/v Grace C m/v Cordova m/v Norpac m/v Roberta M m/v Tani Rae m/v Arctic Sun m/v Kupreanof m/v Mitkof m/v Kathleen K. m/v Pizzonia II m/v Deer Harbor m/v Alaskan Eagle	Frozen Herring	Norton Sound
Lafayette Seafoods	4259 22nd Ave W Seattle, WA 98199	p/v Pribilof p/v Lafayette m/v Cape Denbigh m/v Afognak m/v Bering m/v Tracy D m/v Bull Harbor m/v Chatham m/v Northwind m/v Zingaro m/v Cape Caution m/v Shypoke m/v Midas m/v Dancer m/v Matilda Bay	Frozen Herring	Norton Sound
N.A.N.A Seafoods	PO Box 49 Kotzebue, AK 99752		Fresh Salmon	Kotzebue
New West Fisheries	1100 11th st. Bellingham, WA 98225	p/v New West m/v Rogue m/v Norma Jo m/v Echo m/v Wanderer m/v Rebel m/v Renegade	Frozen Herring	Norton Sound
North Coast Seafood Processors		p/v Polar Queen m/v All American m/v Prelude m/v Sharon A. m/v Yankee Clipper	Frozen Herring	Norton Sound
Oceanic Seafoods		p/b Oceanic Seafoods p/v Pacific Harvest& (barge Harvester)	Frozen Herring	Norton Sound

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Company	Representative Address	Processing or Tendering Vessels	Type of Processing	District
Oceanic Seafoods		m/v Erin Lynn m/v Clover Leaf		
Pan Pacific Seafoods	150 Nickerson S. Suite 108 Seattle, WA 98109	p/v Pacific Producer m/v Amberdawn m/v Maverick m/v Debra D. m/v Lady June m/v Orien m/v Pacific Packer m/v Pavlof	Frozen Herring	Norton Sound
Trident Seafoods	5303 Shilsho Ave Seattle, WA 98107	p/v Bristol Monarch p/b Neptune m/v Lowboy m/v Island Trader m/v Pankof m/v Alaska Shores m/v Tempest m/v Lois Anderson m/v Westling m/v Balena m/v Wanderer m/v Westwind	Frozen Herring	Norton Sound
Whitney Foods	4401 W Intl Airport Rd Anchorage, AK 99502		Fresh Salmon	Norton Sound & Kotzebue

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